The
Electrical Review

VOL. CXVIII. MAY 22, 1936. No. 3052.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY. Price 6d.

THE ELECTRICAL REVIEW, DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1.

Telegraphic Address: "ACEEKAY, SEDIST, LONDON." Code, A B C. Telephone No.: Waterloo 3333 (50 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades and has by far the largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to ELECTRICAL REVIEW, LTD., and crossed "Lloyds Bank."

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Electrical Trading Policy

THE electrical industry owes a deep debt of gratitude to the many men who during a very long period have persistently, and more or less patiently, sat in counsel together trying to produce an electrical trading policy. Yet, notwithstanding all their efforts, it is still affirmed that trading policy has not kept pace with the progress of the industry.

We will not waste words detailing the long history of the deliberations as they have passed from one group of men to another, from one stage to another, and in details have changed their character; we are more concerned to state here the important position that has been reached in May nineteen-thirty-six.

The representatives of eight electrical trade associations, including five classes of manufacturing interest, the wholesalers, and two contracting organisations, have issued, after three years' concentrated effort, a revised trading code which is now recommended for voluntary adoption. We summarise the amended policy, its principles, and its various schedules, later in this issue, but there will probably be many of our readers who will want to supplement this reading with a close examination of the full particulars that have been made available for them in documentary form. They can then judge for themselves whether this recognised code of trading practice will be of greater benefit to them in their section of the industry, than the prevailing uncontrolled conditions. The promoters consider that it will benefit users, distributors, manufacturers and employés in all affected branches of the industry.

The schedules cover wiring accessories, electric light fittings, heating, cooking and domestic appliances, switches and distribution switchgear, electric bells, indicator and bell material, conduit fittings and stationary accumulators. It will be observed that tables of discounts from manufacturers' price lists are set out for (1) electricity supply authorities; (2) electrical contractors; (3) electrical retailers; (4) special large buyers; and (5) recognised users.

Trade agreements already existing between certain associations will be unaffected, it being understood that they conform, or will conform, to the general principles of the Council.

For many years past everybody has seen that the electricity supply authorities as they have become larger and larger purchasers of products required for extending the legitimate business of their areas, could be a powerful factor in helping to ensure the success of such a policy as we have been considering. Through their respective organisations, municipal and company, they have devoted much attention to the subject.

In the code as it lies before us provision has been made for them to receive the same rate of discount as contractors, retailers and special large buyers, but in the general principles it is laid down that quantity buying terms based upon quantity or value of purchases may be given. It is provided, too, that the terms to electricity supply authorities with regard to domestic cookers, shall be a matter of arrangement between them and the manufacturers.

These elasticities in the code, and its voluntary character, demonstrate the desire of the Council to facilitate favourable action on the part of the electricity suppliers. It may be hoped that they will, with substantial unanimity, feel able to lend their valuable co-operation to the movement.

The Position of the Ironmongers

THERE is evidence that ironmongers who are also retailers of electrical appliances are not satisfied with the position set up by the Fair Trading Council. They agree that the policy is a "satisfactory and an acceptable basis of trading," but they have a grievance regarding representation. The term "electrical retailer" as defined by the policy certainly covers them but they consider that they are of sufficient importance to be specifically represented on the Council. On the other hand, the Council thinks that all *bona fide* electrical ironmongers can join the National Electrical Contractors' Trading Association and secure representation on the Council through that

body. The question of dignity seems to be involved and that is often harder to get over than something more concrete. A further claim by the ironmongers is worth noting: this is that their taking up the sale of electrical appliances is not an entrance into a new industry but merely a transition in their own. The industry cannot shut its eyes to the existence of electrical ironmongers, and in point of fact it is not doing so. But we must again repeat what we have said before that the electrical industry does not want any further associations, and we should like to see negotiations between the ironmongers and N.E.C.T.A. reopened. It can hardly be contended, however, that harm will come to the electrical trade through the Ironmongers' Federated Association strengthening and extending its Electrical Section and raising the standard of electrical education of its assistants.

A Scottish Tour

On account of the approaching I.M.E.A. Convention in Edinburgh and the I.E.E. summer meeting which follows close after, Scotland is at present much in the eye of the electrical public. Both in the east and in the west there is a vast amount of electrical interest—particularly in the way of hydro-electric development. For this reason we have recently revisited the areas which members of the Association and the Institution are to tour during their respective gatherings and the results commence to appear in this issue in which we publish the first of a series of articles on Scottish activity. The undertaking of the Clyde Valley Electrical Power Co. possesses many unusual features which will prove most interesting to the I.E.E. members who take part in the summer meeting.

Bus-bar Faults

The serious effects of recent short-circuits at generating stations have raised the question of the practicability of affording complete protection to the bus-bar zone. While the whole of a circuit comprising transformers or cables can be instantaneously disconnected under fault conditions, the same does not apply to switchgear, part of which may remain tied on to the system after its failure. Home Office Regulation No. 8 stipulates that every part of a system shall be protected from excess of current, if necessary to prevent danger. As a system is defined as including all apparatus electrically connected to a common source of supply and danger may arise from fire as well as from shock, a review of general practice in relation to its adequacy under working conditions appears to be called for.

A Noteworthy Feat

Last week-end the Southern Railway reached the culminating point of a remarkable piece of work upon which it has been engaged for the past few months. This has comprised the construction of a fly-over near Wimbledon, and the rearrangement of trackwork to keep the local electric services clear of the lines for through trains. At the same time a part of an extensive system of colour-light signalling has been installed, enabling the headway between trains to be substantially decreased. All this has been done with the minimum inconvenience to passengers, and great credit is due to the engineering staff and the whole of the men employed on the job. Incidentally, we wonder what the position of the Southern would be to-day if it had not electrified its suburban services during the past few years!

Henley Activities

Sir Montague Hughman, in his speech at the meeting of W. T. Henley's Company last Friday, referred, as chairmen of other cable manufacturing companies have done recently, to the general advance in prices of commodities. Fluctuating prices are a source of trouble to such concerns, and the speaker said it was hard to forecast the future prices of copper, lead and rubber. The company's overseas trade continues to expand, but almost entirely in business with British possessions: foreign trade is restricted for various reasons. The North Woolwich works had a record output of rubber-covered wires and cables. The first half of the new building erected to cope with increasing business of this class came into operation during the year. Much of its machinery and equipment was specially designed and made by the company. The other part of the building comes into working very shortly. At Gravesend works the copper-wire-drawing department made a record output and the output of paper cables steadily increased, while the Engineering Department was so exceptionally busy as to turn out the heaviest weight of goods of any year since it was established. Reference was made to the intense effort in the Henley Research Laboratory on behalf of the Tyre Co. and to progress that is being made with the continuous lead-extruding machine for which a factory has been specially equipped.

Improving Domestic Service

It is the custom of the Electrical Association for Women to announce at its annual conference some new scheme for extending the use of electricity. In 1935 it was the £1,000 all-electric home; this year comes the decision to organise electrical housecraft classes for domestic servants with a view primarily to improving their status. Holders of the new "E.A.W. Certificates for Homeworkers" will no longer have occasion to feel shy of entering an honourable profession which has in recent years fallen sadly out of favour; they will be better equipped for performing their duties in the household and will accordingly be able to demand higher wages. Appreciating the value of electricity they will also be a strong force for introducing new electrical ideas into the household.

Film Studio Distribution

Most installations remain fixed once they are put in, provision for extensions being generally made at the outset—at any rate, nowadays—and a few portable leads meet the need for temporary lighting. In a film studio, however, a large proportion of the distribution system has frequently to be shifted from place to place and portable cables carrying heavy currents are the rule rather than the exception. At the same time, any risk of fire has especially to be avoided. A good example of how very great flexibility can be obtained without causing danger or appreciable untidiness is provided by the new Denham studios (both in studio lighting and in sound recording), which are described in this issue—an example of overcoming difficulties of this kind that, despite differences in practice, has its bearing on other industries. The good atmosphere on the sets in spite of the heat given off by the lighting is an excellent testimonial to the value of air conditioning.

Zero Temperature

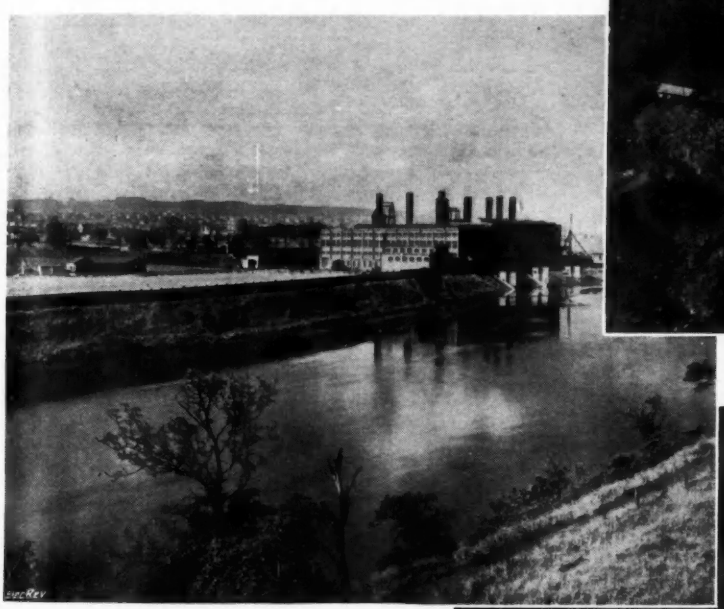
While no theoretical limit is set to the highest temperatures attainable, there is a quite definite minimum at 273.16 deg. C. This is the absolute zero towards which advances have been made since the investigations of Faraday, more than a century ago, until recently, with the aid of high-power electromagnets, the goal has been approached within three-thousandths of a degree. In getting thus far, much of practical value has been gained, including the rare gases used in street lighting due to liquefaction of air. There is also the, as yet unexplained, phenomenon of super-conductivity, which occurs a few degrees above absolute zero. The essential point, as Dr. J. D. Cockroft stated in a lecture a few days ago, is that molecular motion reaches the lowest value at zero temperature, and the implications of this are far-reaching. This lecture, which was given at the Science Museum, South Kensington, provides an illustration of the use of such places for showing the continuous progress in the application of science, which Sir William Bragg, in opening the "very low temperatures exhibition" there, emphasised was their proper function no less than the recording of past achievements.

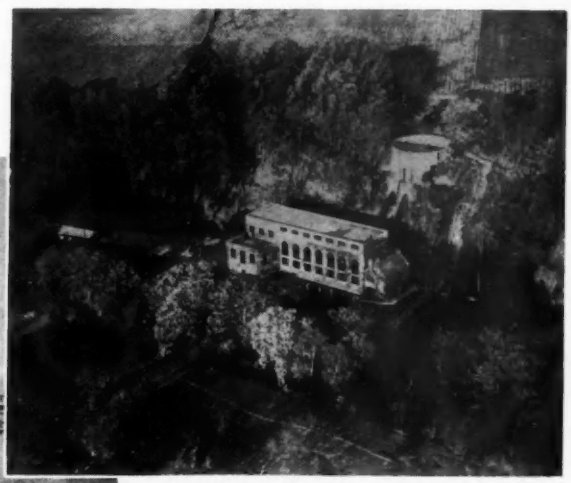
The Clyde Valley System

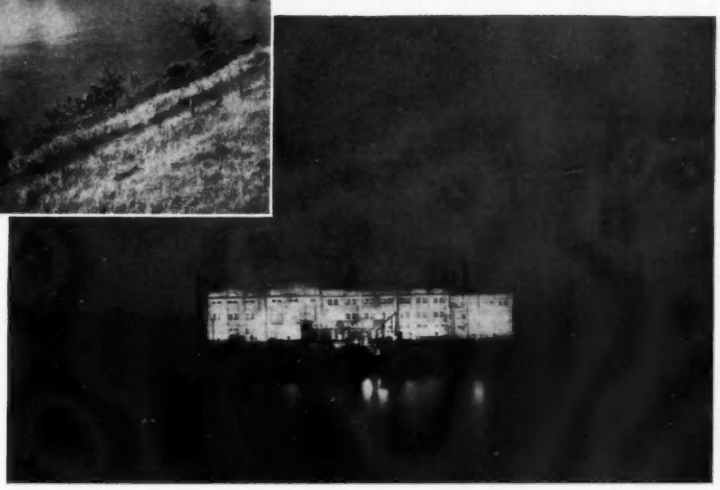
Group generation from steam and water power

ALTHOUGH the operation of the power stations of the Clyde Valley Electrical Power Co. and its associate, the Lanarkshire Hydro-Electric Power Co., is under the control of the Central Electricity Board, the advantages of group working are maintained by the separate interconnection of the system and by the judicious running of the components (steam and hydro-stations) in relation to both the local supplies and the grid. The plant capacity of the whole group at the moment is 147,520 kW, made up as follows: Clyde's Mill steam station 80,000 kW, Yoker steam station 52,000 kW and the two hydro-electric stations 15,520 kW. The steam stations are run "fairly continuously," with load variations to suit C.E.B. demands, while the water stations are run "practically all out continuously" as a base-load supply.

Maximum demands upon Clyde's Mill, Yoker, these two steam stations combined, the combined water stations, and the whole system were, respectively, 59,930 kW, 48,650 kW, 107,740 kW, 16,050 kW and 114,380 kW. The m.d. of the Clyde Valley undertaking was 103.840 kW, while that of the grid supply from the group was 41,870 kW. Just under 351 million kWh was supplied to the Clyde Valley undertaking, while a little over 56 million kWh was exported to the grid. The supply and plant load factors for the whole group were 40.28 per cent. and 71.69 per cent. respectively, while the corresponding figures for Clyde's Mill, Yoker, the combined steam stations and the combined water stations were 30.49 per cent. and 72.25 per cent., 38.31 per cent. and 68.22 per cent., 34.26 per cent. and 70.15 per cent., and 57.1 per cent. and 78.86 per cent.







Left: Clyde's Mill. Top right: Stonebyres (hydro-electric). Bottom right: Yoker at night

The generating stations and the Motherwell switching station are on an almost straight line from north-west to south-east through Glasgow, with Yoker and Clyde's Mill on the outskirts of the city at the north-west and south-east, respectively, and about fifteen miles apart, Motherwell about ten miles south-east of Clyde's Mill, and the water stations at Stonebyres and Bonnington at the other end about ten miles farther on from Motherwell.

Generation throughout is at 11 kV and all the points are interconnected, the direct connection between Yoker and Clyde's Mill being at 22 kV. There are grid connections at each of the two steam stations and at Motherwell, but the direct interconnections are maintained to preserve the advantages of group working, to facilitate the operation in respect of local supplies (each station has its own distribution) and also to afford a measure of security in the west, where Yoker is now the only generating point on the grid.

The supply and erection of a new 30,000-kW turbo-alternator at Clyde's Mill constitutes something like a record, we should think. The set was ordered in March of last year and it had its preliminary runs in December. In conjunction with this work the necessary extension of the turbine room was built and the concrete river intake basin for the circulating-water system had to be lengthened, involving temporary damming of the "open" end of the basin. In common with the other sets in this station the new one has its own independent circulating system. The turbine has three stages of steam bleeding (two low and one high pressure) for feed-water heating.

The new generating set (Metropolitan-Vickers) has brought the capacity of Clyde's Mill up to 80,000 kW, but this is likely to be reduced soon by 12,000 kW under a scheme which provides for the conversion of the oldest part of the turbine house, where there are now two 6,000-kW sets, to a new main switch-house for the generator switchgear. The new switchgear will probably be of the ironclad type. The present generator and feeder switchgear is cellular equipment, and when the new gear is installed the cellular generator switches will be used for feeder work.

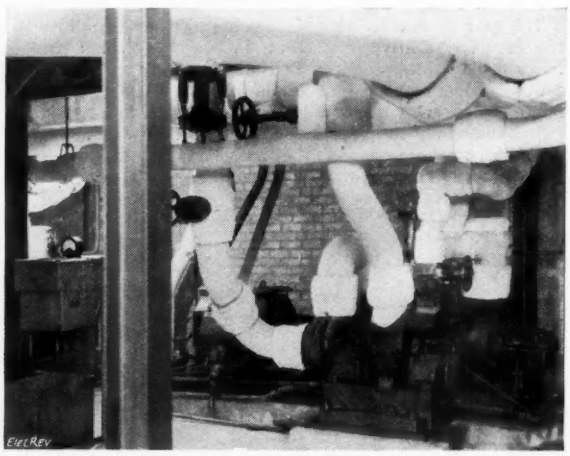
A somewhat curious feature common to both Clyde's Mill and Yoker is the letter "L" shape of the turbine rooms. One wing of the right-angle room at Clyde's Mill, bordered by the control board and the existing switchgear, is to become the new switch-house.

There was sufficient boiler plant already installed to meet the additional requirements of the new set, for the last extension of four 100,000-lb. per hr. Babcock & Wilcox boilers (400 lb./sq. in. and 725-750 deg. F.) brought the total station steam capacity up to about 800,000 lb. per hr. The overall thermal efficiency of the station last year was 19.28 per cent., 1.5288 lb. of coal, or 17,700 B.th.u., being consumed per kWh supplied.

More than 109,000 tons of coal was consumed at the station last year. Coal handling is by rail truck tippling to an underground conveyor and elevator system for transportation to the overhead boiler bunkers, and extensions now in hand will bring the coal-storage capacity up to 30,000 tons. Ash removal is effected pneumatically, the handling system incorporating a crushing plant.

At the Yoker station we saw a number of men, with the

help of a large electric crane, pneumatic drills and blasting gear, quickly removing a double row of old boilers to make room for four new 100,000-lb. per hour equipments. These will be part of an immediate station extension which will also include a 30,000-kW turbo-alternator. There will be no building extension for the new set. Two 3,000-kW sets have been removed from the "free" end of one wing of the turbine room, and the consequent clearance space, together with that



Feed-water pump installed with the new set at Clyde's Mill

which will be provided by the removal of a 5,000-kW set adjacent to and in line with the smaller ones, will provide accommodation for two 30,000-kW sets; thus 60,000-kW will replace 11,000 kW.

The last boiler plant extension at Yoker embraced a fine piece of structural alteration work. Six new 45,000-lb. per hr. boilers were installed in line facing six existing 33,000-lb. boilers, but with a firing-floor level about ten feet lower. At the same time, the grates of the smaller boilers were lowered to suit the new level, the boilers themselves being retained in their original positions. The consequent increase in the size of the furnace chambers and the higher firing arches, together with other modernising schemes on the boilers, resulted in a capacity increase for each old boiler to a figure nearly that of each new equipment.

In contrast to the circulating system at Clyde's Mill there is a pumping station common to the whole of the turbine plant at Yoker. Extensions now in hand will increase the coal-storage capacity to 20,000 tons. A radial crane which distributes and reclaims over a semi-circular storage ground is an interesting feature of the coal-handling plant. The overall thermal efficiency of the station is 19.5 per cent.

No doubt the outstanding feature of the hydro-electric stations is that the waters of the Clyde are utilised in an unregulated state, the lack of storage being "covered" by the group working with the steam stations. Each station has two turbo-alternators, Bonnington having a total capacity of 9,840 kW and working under a 189-ft. head, and Stonebyres a capacity of 5,680 kW with a head of 97½ ft. In each case a tunnel through the hills conveys the water to a surge tank from which a pipe line carries the water to the turbines.

The river flow is intercepted by tilting weirs, and in each case a float regulator controls the quantity of water passing through the turbines at any given instant to suit the river flow conditions. The float actuates a transmitter resistance which, with synchronising, governor-control and balancing resistances, forms a Wheatstone-bridge circuit. The effect of a rising river is to alter the setting of the transmitter resistance, which disturbs the balance of the bridge and causes a relay to start the turbine speeder motor, thus tending to increase the turbine speed, but as the alternator speed is "tied" by the system frequency the load is increased instead.

Metal Production in Russia

The use of electricity

THE most important non-ferrous metal producing organisation so far established in Soviet Russia is the Balkask Copper Smelting Combine, Kagakstan, states *Electrochestwo*. This undertaking has its own thermal electric station with turbo-generators rated at 24,000 kW, 3-phase, 10,500 V. The copper ore is mined some 24 km. from Balkask and electrical energy is transmitted from that town to the mines by duplicate overhead lines at 35 kV. The open mines, or quarries, are worked with electrically operated excavators supplied at 3,000 V by means of flexible rubber insulated cables tapping a transportable overhead line.

In addition to supplying the excavators, electricity is also used for boring machines and portable air compressors, which operate at 500 V and are supplied from small travelling sub-stations. The ore is conveyed to the mills by electrically driven locomotives working at 825 V d.c., the total length of railway line being 60 km.

Three sub-stations supply the mine and the railway through eleven transformers and eleven type "P.B.-20" mercury arc rectifiers. For lighting the face of the quarry 500-W projector lamps are fixed on the excavators and for general lighting they are on portable masts 3½ metres high. The total load is 40,000 kW, and of this 30,000 kW is in respect of 1,500 motors. By the use of synchronous motors for the rolling mills the power factor of the whole system is maintained at 0.92. Approximately one million tons of ore per annum is now being mined.

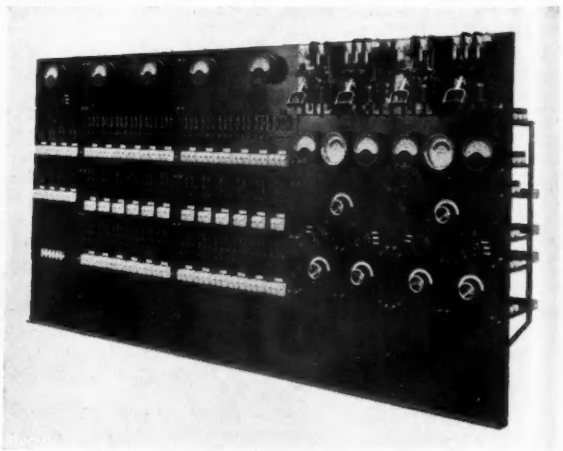
In the copper smelting works the ore undergoes a fluxing treatment and provides 100,000 tons of black copper per annum. The works absorbs some 14,000 kW, most of which is required to feed 400 motors ranging from the fractional horse-power type up to 3,000 h.p. synchronous machines. Certain of the important electric drives in the smelting works, such as the equipment installed in connection with the air blast, must be safeguarded against breakdown, and provision is made for a duplicate supply to such motors from storage batteries, which is automatically switched on in case of failure of the main supply.

In connection with the refinement of metals by electrolysis, there is a definite tendency towards the use of mercury arc rectifiers in place of rotary machines for converting to d.c. At the Electrozinc Works in Ordshonikidse the supply to the electrolysis baths is obtained through four mercury rectifiers, the two series of baths requiring a total of 9,000 A at 575 V.

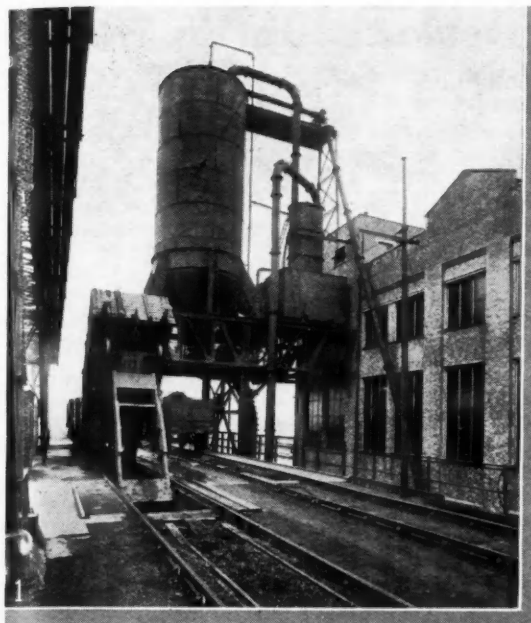
At the Dnieprovskom Aluminium Works the first high-power mercury rectifiers, type "P.B.-70," are already working. They feed the electrolytic baths with a total of 35,000 A. Additional rectifier equipment having an output of 50,000 A is already in hand.

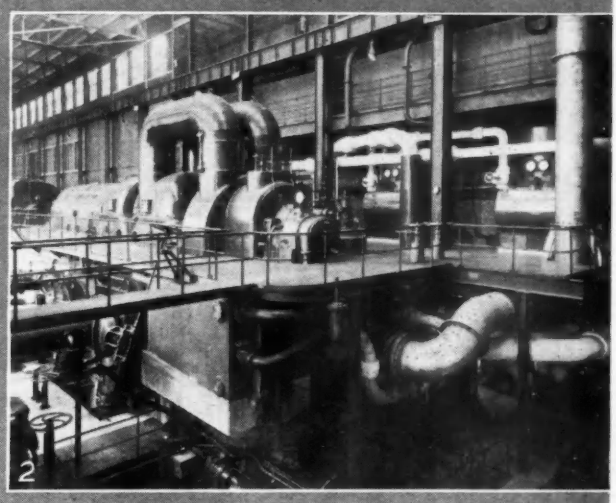
A still larger and more elaborate mercury rectifier plant is that at the Uralskom Aluminium Works which, according to plan, should be completed this year. It is claimed that this plant will be the largest of its kind in the world. Energy will be taken to rectifier sub-stations at 10 kV, 3-phase. The electro-deposition baths will be 300 in number, requiring a total of between 92,000 and 100,000 A at 700 V. The process requires smooth and automatic regulation of voltage of about 15 per cent., and it is found that this characteristic is obtained more readily and at less cost by means of mercury rectifiers than with rotary convertors.

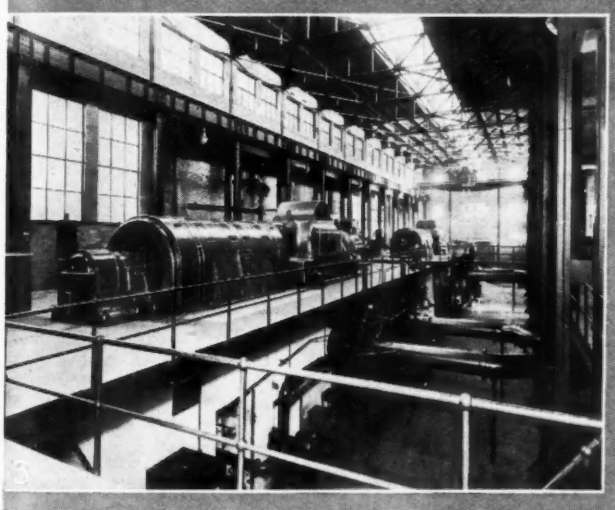
The rectifier equipment which is to be installed at the Uralskom Works will consist of twenty type "P.B.-70" rectifiers and six spares. Each unit will comprise one main transformer of 12,000 kVA and two type "P.B.-70" mercury rectifiers. The plant will be housed in a single storey sub-station 210 metres long by 19 metres wide, the control and protective apparatus being installed on a superstructure above the central portion of the building.

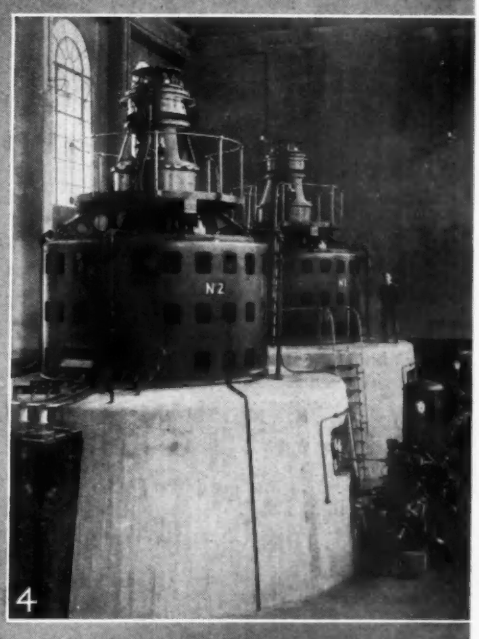


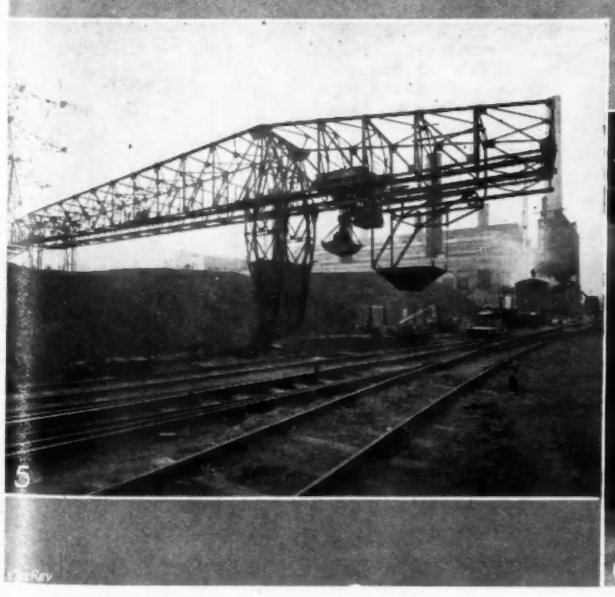
The main switchboard for the Sound Department at the Denham Film Studios. **(See page 741)**











Power Station Plant in the Clyde Valley. (See preceding pages)

1. Coal tippler and ash receiver at Clyde's Mill. 2. The new 30,000-kW set at the same station. 3. Two 20,000-kW sets in one turbine house wing at Yoker. 4. Water turbines at Stonebyres. 5. Radial coaling crane at Yoker. 6. Photograph taken during the installation of new boilers and the modernising of old ones at Yoker; note the two firing-floor levels.

The A B C of All-in Domestic Tariffs

By a consulting engineer

TARIFFS for domestic premises are becoming a by-word. It is as though electrical engineers, debarred from the once happy hunting grounds of voltage and frequency, had turned loose their inventive ingenuity into the, as yet, unfenced pastures of domestic supply. Perhaps the time for standardisation is not yet, but surely the rough outlines are already taking shape. If it is still too early to lay down the precise terms of a standard tariff, may we not at least take the first step by defining its form? For, after all, these innumerable tariffs, however different in outward appearance, have one feature in common. In essence they are variants of the old-established m.d. form of tariff upon which the whole structure of electricity supply is founded. They have come into existence because a straight m.d. tariff is obviously inapplicable to domestic supply.

An industrial consumer has a job of work to do and his m.d. can be foretold with fair accuracy. Even if, from year to year, his m.d. should increase or decrease there should be no need on that account to alter the kW charge, for, over a fairly wide range, the cost of making the supply available to him is for all practical purposes proportional to his m.d. It is an easy matter for the supply authority to fix the kW charge to an industrial consumer, for all the elements of which it is composed are known in advance and are reasonably stable.

The case of a domestic consumer is quite different. Into the cost of making the supply available to him there enters the important element of distribution, which is much the same in amount whether his demand is 500 W or 5 kW. Thus a kW rate suitable for one consumer might be many times too high or too low for another, and a rate which was appropriate to a particular consumer last year might be quite unsuitable now.

The Assessed Charge

If the principle of an m.d. tariff is to be extended to domestic premises it must be based not on the ascertained m.d., but on a predetermined (or assessed) m.d., and that is, in fact, the foundations upon which have arisen the many extant varieties of domestic tariffs. One and all they invoke the concept that some quality of a consumer's premises is a measure of his probable m.d. That quality is most frequently either value or size, but some authorities regard the number of rooms as a surer guide. Each alternative has its special merits and demerits, but value (in terms of rateable value) and size (in terms of floor area) seem to be most in favour and are the most likely survivors.

What ever may be the basis of assessment, the consequence of diversity is that the greater the number of consumers the less effect will the m.d. of each one of them have upon the m.d. of the system as a whole. So, also, the greater the number of consumers the less will be the proportionate cost of distribution and the less, therefore, the cost per kW. Thus, the remunerative m.d. charge, or fixed charge, to any consumer will, for two reasons, tend to decrease progressively with the growth of the system.

From these elementary considerations it follows that the scale of assessed fixed charges may be ascertained by quite arbitrary, even rough and ready, methods. A fixed charge is self-correcting, for if set too high it will be ineffective, and if too low will soon be redressed by a welcome avalanche of new consumers desiring a supply.

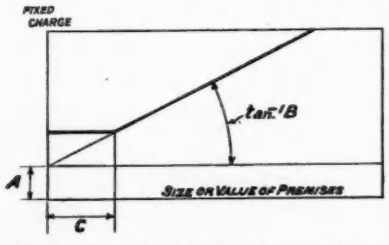


Fig. 1.—Proposed standard form of tariff

As new consumers and increased consumption are the objectives of every progressive undertaking, the primary consideration should be to make the scale of fixed charges as low as possible. Some undertakings actually equate the fixed charge to the sum which they consider a consumer would be prepared to pay for the adequate lighting of his premises. To others, that may seem to be an over-bold step, but it is probably well worth while, for it goes a long way towards eliminating that bugbear of all undertakings, the consumer who makes parsimonious use of electricity for lighting purposes only.

In order to reduce all varieties of domestic all-in tariff to one common form it is only necessary to bear in mind that the cost of making the supply available to a consumer is compounded of two elements. One is substantially the same for all consumers. The other, subject to some minimum, is roughly proportional to the value or size of his premises.

The fixed charge of a domestic all-in tariff will then assume the standard form shown in fig. 1, in which A is that portion of the fixed charge which is the same for all consumers. B is the additional charge per unit of size or value, C is the minimum size or value that can be claimed for any premises.

If all the existing scales of fixed charges based on rateable value were converted into the nearest equivalent scale of the form shown (in fig. 1) they would at once become directly comparable one with another, and a similar procedure would have the same effect on scales derived from the amount of floor area.

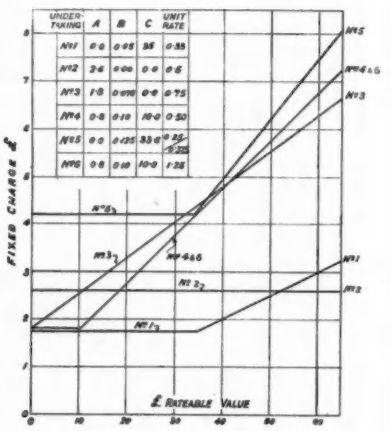


Fig. 2.—Six actual tariffs with A, B, and C

Many existing scales are quite easily converted into the proposed standard form, and a few of them, all based on rateable value, are reproduced, both graphically and in tabular form, in fig. 2. To make the comparison complete the unit rates are also noted. The same standard form (with appropriate values of A, B and C) is equally applicable to non-domestic premises, such as licensed houses, clubs and shops. Let it be added that a standard form of fixed charge in no way precludes special tariffs for such circumstances as off-peak water heating and supplies to isolated buildings.

Wholesale conversion of all existing tariffs into a simple three-part-and-minimum tariff is perhaps not to be expected until imposed from above, but it is an essential preliminary to that unification of domestic charges which cannot much longer be postponed. Reasonable uniformity of charges implies that all tariffs should be expressed in one standard form.

Transport Congress

ONE of the three papers submitted at the Congress of the Institute of Transport at Birmingham (May 20th to 23rd) was by Mr. A. C. Baker, who dealt with municipal passenger transport. Commencing with a short outline of tramway history, the author proceeded to compare motor and trolley buses, pointing out that the use of the latter had developed considerably during the last three years. At present they were operated by twenty-six local authorities and five companies, in addition to the London Passenger Transport Board, while twenty-three other local authorities had the necessary power to employ them, but had not yet exercised it. At the present price of fuel oil electricity for traction would have to be supplied at less than 0.5d. per kWh to make the trolley bus an economical proposition when compared with the compression-ignition engined bus.

The trolley bus was more silent in operation and had better acceleration, but it had not the mobility of the motor bus inasmuch as it could not be rapidly transferred from one route to another. It was also slower when negotiating junctions and curves. The traffic peak load had been considerably accentuated by the establishment of housing estates. In some towns 70 per cent. of the rolling stock lay idle between 9.30 a.m. and 4.30 p.m., there being very little additional mid-day traffic. The fact that a double-deck top-covered bus must earn at least £300 profit per annum to cover capital charges showed how costly it was to provide £1,800 vehicles simply to do a few journeys in the morning and evening.

Mr. Baker said he found it difficult to appreciate how an underground railway could ever pay its way in a provincial city where there was little mid-day traffic. It had been stated that a London tube cost £750,000 per mile to construct, and that to be self-supporting a density of traffic of twenty million passengers per route-mile per annum was required with fares based on 1d. per mile. If London, with its huge floating population, could barely provide the necessary traffic density, what possibility was there of a provincial town doing so? But the author considered that there was reasonable prospect of suburban railways being electrified in suitable districts with the primary object of providing transport between large industrial areas and the surrounding towns.

Electricity in the Factory.

By D. Winton Thorpe, A.M.I.E.E.

Providing for extensions

BADLY organised factory wiring and factory electrical installation will never achieve good results. Indeed, half the reluctance which is apparent to-day on the part of some factory proprietors to accept electric motive power completely is probably due to their having had some smattering of experience with a badly organised electrical installation.

A contemplation of the wrong way of doing things is apt to succeed in pointing to the right way, and if we go into very many factories to-day we find some deplorable examples of the wrong way of installing electricity. The excuse, and a reasonable one, is that the factory production has grown and as production has grown new machines have been added, cables are found to have inadequate capacity and therefore odd feeders are run back to what is frequently a heavily overloaded and chaotic switchboard. In order to save the cost of a new motor, the works engineer will perhaps be instructed to fit an unemployed 10-h.p. motor to do a 5-h.p. job, in spite of the fact that a factory running on these lines has its mains and cables clogged with wattless current and its machines turned by inefficiently running motors.

The whole thing is apt to grow up haphazardly to a state where (and this is not surmise, but is based on several distressing experiences which, no doubt, will be confirmed by works electricians) entire replanning and rewiring of the electrical installation of the factory at a very great cost repays the factory proprietor hand-over-fist, if interest and depreciation on the cost of this rewiring are set against the annual saving due to efficient working. Had that same factory not been allowed to grow up in a haphazard fashion and had the initial plan been capable of taking care of the increased business or alteration in plant position, the same efficiency could have been secured without incurring the cost of rewiring.

It is easy to say in print that it is wise to make provision for future expansion, but it is, I know, quite a different matter to draw in one's mind the line which separates reasonable future expansion from pure extravagant anticipation. Furthermore, it is one of the hardest things in the world to persuade some factory proprietors to make any provision for the future. However, the wise engineer, by the exercise of a good deal of discrimination, can and should so contrive his factory electrical installation that additions which may have to be made to that installation can be made at a minimum of cost.

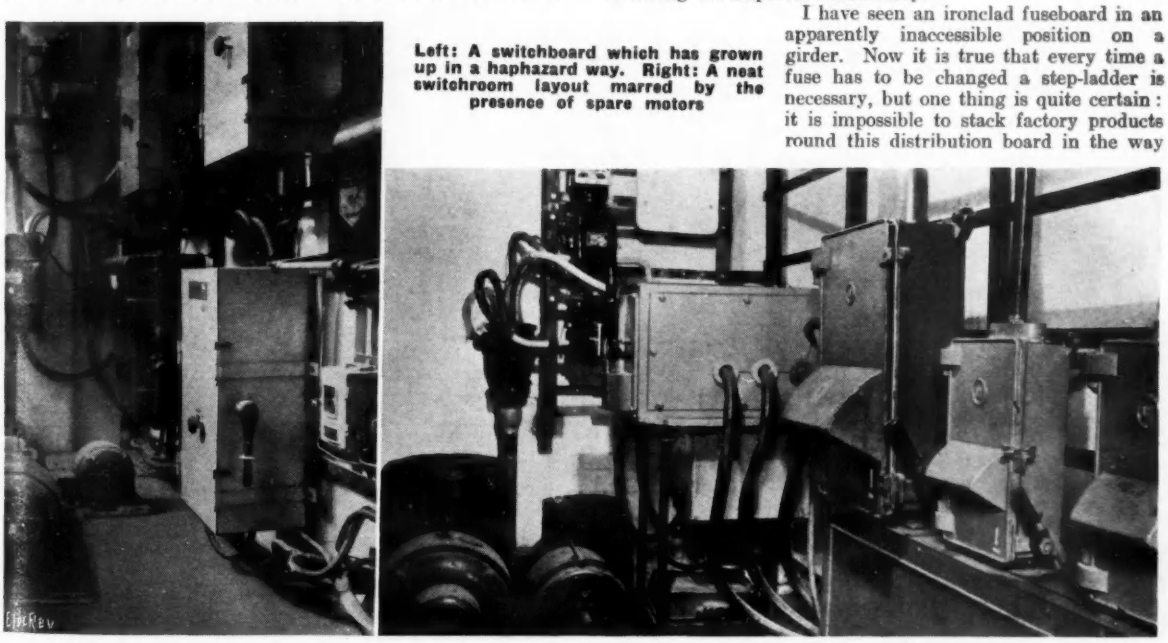
An elementary example of this is a run of cable. Where a cable, say, of 19/.064 size has to be run to serve a distribution fuseboard, but where (for the sake of argument) it is proposed to run this cable in the form of v.i.r. in conduit, it is *not* necessary to provide for future expansion of load in the form of a larger cable than 19/.064, but it *is* wise to install a 2-in. tube to accommodate this instead of the 1½-in. tube, which would have been adequate for immediate needs.

Perhaps there is no piece of electrical equipment which gives such value for money expended as the bus-bar chamber. I have seen many factories where the practice has been to loop tails in and out of circuit-breakers and switchfuses on the main switchboard; and then again at sub-distribution points to pursue the same method of looping till the terminal sockets are overcrowded with cable ends, contacts are bad, dangers immediately arise from arcing and disconnection, and the whole board begins to look like the morning after Christmas festivities. If every main switchboard and sub-distribution point is centred round a bus-bar chamber, extensions and altered connections are quickly and easily effected.

One of the first indications of expansion of production in a factory is the accumulation of stock—of products. While a new mill or new wing is being built every gangway and every bit of wall space gets absolutely cluttered up with products of the factory awaiting shipment. Over the heads of the designer of a factory electrical installation and the works electrician the prospect of products being stacked round some important distribution centre hangs like the sword of Damocles. For this reason I am inclined to think that in the original placing of any important electrical equipment such as fusegear, switchgear, &c., the best place in the long run, however apparently inappropriate it may be, is one which is right in among the important machinery.

Left: A fuseboard and local switches out of harm's way, with pull-push arrangement. Right: A fuseboard mounted on a girder clear of the factory products

I have seen an ironclad fuseboard in an apparently inaccessible position on a girder. Now it is true that every time a fuse has to be changed a step-ladder is necessary, but one thing is quite certain: it is impossible to stack factory products round this distribution board in the way that has happened in another instance within my experience, where there is a distribution fuseboard on the wall behind about six feet of paper reels! In another case a distribution fuseboard and local switchboard (ironclad) is mounted high up on a stanchion. Although to operate this it is necessary to use a pole with a hook on the end—the switches are fitted with push-pull rods—the gear remains accessible however



Left: A switchboard which has grown up in a haphazard way. Right: A neat switchroom layout marred by the presence of spare motors

many factory products are stacked round the stanchion.

Not only have we the difficulty of coping with production fouling our electrical gear, but we have the usual amount of mechanical "junk" for which the staff engineer has to find some home. Anything that can be done to prevent the misuse of switchrooms is good, as the effect of a neat switchroom is spoilt by using it also as a storeroom for spare motors. In this connection I took this photograph of the newer switchboard, with bus-bar chamber illustrated, by resting my camera on a solid wall of stacked paper which entirely covered the entrance to the switchroom.

I suppose that no article on factory electrification to-day would be complete without some reference to the vexed question of whether machines should be individually driven by separate motors or driven by line-shafting operated by one large motor, or whether a compromise should be employed in the form of small groups of machines driven *via* a lay-shaft from a medium-sized motor. Here again it is utterly impossible to generalise or lay down the law. The whole question must be governed by the type of machinery to be driven. If the machines are such that they require a heavy starting current, thereafter subsiding to comparatively low running current, then individual drive, with all its obvious advantages, must be qualified by consideration of the inefficient manner in which the motors will be running for most of their time and to the bad power factor which will obtain in general.

It seems hardly worth while to give examples, but if we consider five machines taking 5 h.p. each when running, a 25-h.p. motor will be capable of driving all these machines at the same time and the motor will be running at full load with the greatest possible efficiency. If, on the other hand, each of these machines takes 10 h.p. to start it up, the 25-h.p. motor will still do the job provided that they are not all started up together. I am not attempting to give figures with any exactness, but the principle remains.

At the other end of the scale the contemplation of yards upon yards of line-shafting driven by a heavy motor with perhaps only a third of the machines on that line-shafting being operated, again provides a dismal outlook for the efficient running of the big motor. In factory work, line-shafting was the beginning. There has since then been quite properly a swing-over in the direction of individual drive, whereas now it is probable that there is a general tendency for the situation to settle down to group drive or individual drive according to circumstances.

The problems of factory wiring and factory electrification in so far as they are strictly technical in nature present problems which are at least of a precise nature. We can calculate loads, cross sections of copper conductors, power factor, &c., but we cannot possibly calculate either future production (we could make a lot of money on the Stock Exchange if we could) or the whims and fancies of factory executives as time goes on. The real art of factory electrification and maintenance lies in accurately estimating unknown quantities, or providing installations which can be easily altered. When a conjurer is giving an entertainment his tricks often go wrong. The art of conjuring is the ability to switch over in the middle of a trick to a completely different solution because some mistake has been made in the first. It is much the same, I am inclined to think, with factory electrification.

A Reconstructed Pumping Station

THE Bourne Vale pumping station of the South Staffordshire Waterworks Co., near Brownhills, was built in 1892, the old plant comprising two vertical compound rotative steam pumping engines with Lancashire boilers. These had a total capacity of 2,500,000 gal. per 24 hr. against a total lift of 450/480 ft. when running at 17½ r.p.m. The station has now been re-equipped with new pumping plant consisting of two sets of electrically driven, variable speed, directly coupled, vertical spindle, centrifugal combined well and force pumps of the multi-stage type, working in series, manufactured by Messrs. Sulzer Bros. (London), Ltd. Each set is required to work under two separate conditions corresponding to the maximum and minimum levels of the water below the pump-house floor level, as follows: (*a*) Each set to pump 750,000 gal. per 24 hr. with the water level 30 ft. below against a total head of 320 ft., and (*b*) each set to pump 1,500,000 gal. per 24 hr. with the water level 80 ft. below against a total head of 350 ft. For these different quantities of water to be dealt with it was necessary to install variable speed motors. Under the maximum condition (*b*) the new plant is capable of delivering a total quantity of 3,000,000 gal. of water per 24 hr.

The contract for the whole of the electrical plant, including the cabling installation, was placed with the British Thomson-Houston Co., Ltd., through Messrs. Sulzer, who were the main contractors for the new installation. Each electrical set comprises a 200/70 h.p., 850/620 r.p.m., variable speed, a.c. commutator motor with a separate 25-kVA motor-driven slip regulator, together with the necessary low-voltage contactor control board, power transformers, &c.

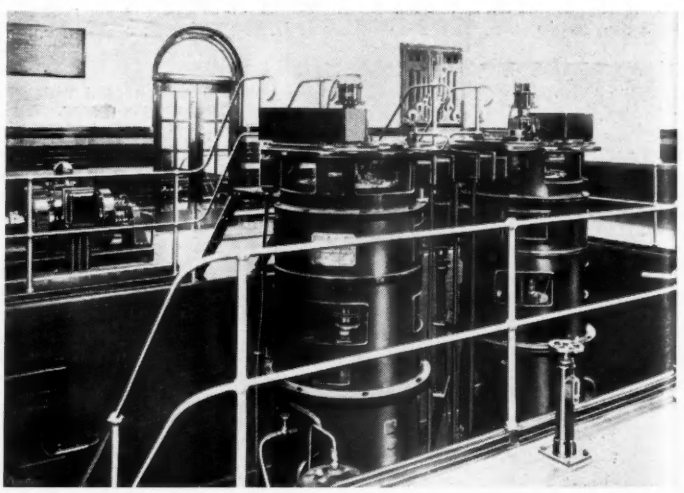
The "No-lag Scherbius" scheme was adopted to give a characteristic almost identical with that of the standard B.T.H. type "CH" variable speed a.c. commutator motor, with the addition of power-factor control. The main motor constructed as a modified "No-lag" machine has a small separate slip-regulator of the commutator type. The speed is regulated by simple movement of the commutator brushgear of the main motor, and a high efficiency is maintained over the whole range, the slip power being transferred to and from the supply (without the interposition of resistances) through the slip-regulator. Owing to the main motors being of the vertical spindle type the slip-regulators are driven by separate slip-ring type induction motors.

Drip-proof pattern main motors (type "CPVT94") are installed. They have Michell oil lubricated guide and thrust bearings and pilot motor operated brushgear. Mounted on each motor is the transmitter portion of an electrically operated tachometer that registers the speed of the motors on "Circscale" instruments mounted on separate control pedestals adjacent to the main motors.

Each slip regulator set consists of a type "ST6344" 25-kVA regulator directly coupled to a type "GMT6529" slip-ring motor running at 1,500 r.p.m. Unity power-factor is maintained at all loads and is controlled by a small regulating rheostat connected in the field circuit of the slip-regulator and mounted on the main control board.

For low-voltage control there is a seven-section switchboard made up of sheet-steel cubicles with hinged interlocked front doors and designed for push-button control. It contains two incoming transformer panels; two motor panels; one instrument panel; one panel for controlling the crane, lighting, and auxiliaries; and one earthing panel.

The main contactors are of the latched-in type, and the push-buttons for "start," "stop," "raise speed" and "lower speed" are mounted on the separate control pillars which carry the speed indicators. These separate control pillars were found to be necessary owing to the fact that the main control board is in a separate house adjoining the pump room. The incoming power supply is taken from the Walsall Corporation mains at 6,600 V, 50 cycles, 3-phase, and is reduced to 400/230 V by two 200-kVA oil-immersed, self-cooled, indoor type transformers built in steel-plate tubular tanks.



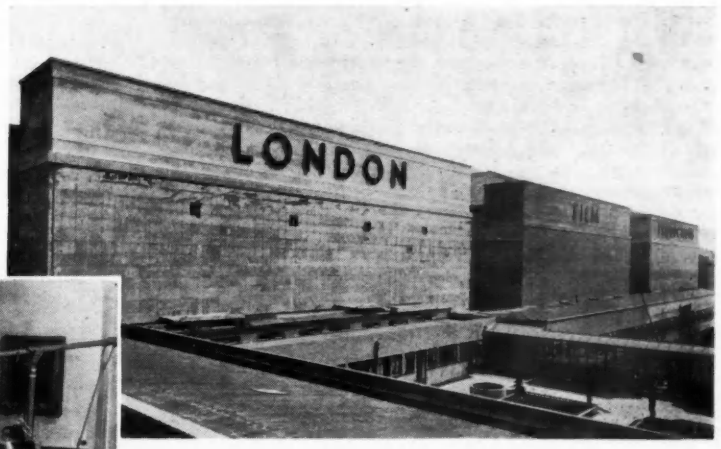
The main motors; regulator sets on the far side of the pump pit

In addition to small auxiliaries, the reconstruction scheme included the electrification of the existing hand crane and a new lighting installation, also carried out by the British Thomson-Houston Co.

The accompanying photograph is reproduced by courtesy of Mr. F. J. Dixon, M.Inst.C.E., M.I.Mech.E., engineer-in-chief to the South Staffordshire Waterworks Company.

The Denham Film Studios

A 4,500-kW oil-engine power station providing electricity for an important British producing unit



Above: Outside view of studio. Left: A scene from "Southern Roses," in which Miss Sara Allgood, Miss Gina Malo and Mr. George Robey take part

THE new studios of London Film Productions, Ltd., occupy twenty-eight acres of a 165-acre estate on the banks of the River Colne at Denham, near Uxbridge. They have been laid out specifically for sound and colour processes. The buildings, designed by Mr. J. Okey, will include, when complete, seven interior stages with an aggregate area of 120,000 sq. ft., a large machine shop, a foundry and other workshops for the construction and repair of accessories for film production.

The electrical installation, for which the film company's chief engineer, Mr. A. Johnson, was responsible, is used mainly for lighting and the extent of its application may be gauged from the capacity of the generating plant installed, viz., 4,500 kW. This is made up of six 750-kW 250-r.p.m. units, each composed of a Crossley-Premier eight cylinder *vis-à-vis* four-cycle airless injection Diesel engine driving a Mather & Platt 230-V d.c. generator (having a low ripple value) and a static balancer. Provision has been made for two further sets.

Super-charging is available by means of Keith Blackman blowers driven by 86-h.p. Mather & Platt motors, supplied direct from the generators and controlled by Brookhirst switchgear. The overload rating is 25 per cent. for two hours.

About 75 million B.th.u. is recoverable every twenty-four hours from the exhausts which pass through Spanner thimble-tube boilers employed in conjunction with the plenum system of the Air Conditioning Corporation (Jeffreys), Ltd. Duplicate intake fans for this plant with a duty of 135,000 cu. ft. per min. are driven through Texropes by 38-h.p. 600-900-r.p.m. motors supplied by Laurence, Scott & Electromotors, Ltd., controlled by Brookhirst panels. Mather & Platt washer pumps running at 1,150 r.p.m. are also driven by L.S.E. machines.

Among the auxiliaries in the engine room are a two-stage Ingersoll-Rand compressor used in connection with the foundry cupolas, requiring a 26-h.p. M. & P. motor, and a Hopkinson centrifuge for oil treatment. Communication between the engine room and the control room is by means of a T.M.C. marine telephone the operation of which is assisted by vibrations of the speaker's larynx.

The main feature of the control room is a switchboard made by Johnson & Phillips, Ltd., which company also supplied the distribution cables throughout. In the centre is a desk which is arranged for push-button operation of the Bertram Thomas generator switches in the basement and of the engine governors.

On each side of the desk are vertical panels, connected to which *via* English Electric h.r.c. fuses are feeders supplying the various buildings, except the studios, and also the two automatic voltage regulators. On some of these panels are the meters for the studio circuits, the J. & P. air-break switches for which are manually operated in the basement, where there are also duplicate 220-kVA motor alternators (Crompton Parkinson) for providing three-phase 400-V supply for workshop power.

Energy is conveyed from the basement panels to the studios by copper-strip conductors (the neutral one-third the size of the outers) run in the ventilating ducts on mica and slate insulators, mounted on angle-iron brackets, and continued round each studio. Four J. & P. distributing panels (fitted with ammeters on the two poles), each with sockets for three positive, three negative and six neutral plugs, have been provided on both sides of the studios with three more at gantry level for overhead lighting (most of the studios are 45 ft. high to the roof trusses). Fireproof and t.r.s. cables are run from these points to three-way fuse boxes containing English-Electric fuses, to Kandem 60-A three-way arc-lamp distributor units or to sound-recording systems. "Arctite" fuses by the Artic Fuse & Electric Manufacturing Co. are also used for a number of the smaller circuits.

Stage lighting alone requires 50,000 A at 110 V (it must be without flicker) and temporary lighting amounts to a further 120 kW. This has necessitated the use of some thirty-four miles of wiring.

The recording equipment of the Western Electric Co., Ltd., includes a permanent monitor booth containing loudspeakers for each of the three main stages (250 by 120 by 45 ft. high). If the recording engineer requires to view the set from another point he can use headphones, the equipment being moved to an appropriate position and connected by flexible cable to the booth.

The sound-recording building is some distance from the

General view of the engine-room

stages and is connected by low-loss cables in stoneware ducts to the monitor booths and stage outlet boxes. Five recording channels will be available, one permanent and two "F" and two "F.B." type Western Electric portable units, the last-named using a small special recording machine, whereas the F type employs a standard studio machine mounted in a portable case.

Power for the portable equipment is derived from 12-V accumulators and 135-V dry batteries. Flexible cords will be used to connect the apparatus in the trucks to the permanent wiring *via* outlet boxes on the garage walls. On location the record and camera motors are driven by a 12-V system incorporating automatic speed control, while in the studio the motor distribution system will be utilised.

Adjoining the sound building are two review theatres. The larger, which measures 100 by 50 by 30 ft. high, is also to be used for recording and scoring. The time of reverberation will be variable continuously between 0.7 and 1.5 sec. by means of reversible panels, the materials on the opposite sides having differing coefficients of absorption. A wide-range reproducing system incorporating a four-base equipment will be employed for reviewing. Two of the bases will be "sound-only" machines electrically interlocked to the master machines; this provides for continuous performances from either single or double films.

Sound can be re-recorded from multiple sources, controlled from the theatre auditorium, by the use of two standard re-recording machines, two theatre-type reproducers, and one 33⅓-r.p.m. and two 78-r.p.m. disc reproducers. Equalisers and networks required for special effects, *e.g.*, varying frequency bands, are to be located in this position. A background suppression unit is being provided for reducing secondary sources of sound by means of a voice-operated attenuator when dialogue is present in the main source.

A permanent monitor room equipped with mixer and wide-range monitoring system will provide facilities for musical scoring with microphones placed on the theatre stage, *i.e.*, recording orchestral accompaniment to the film after the scene has been taken.

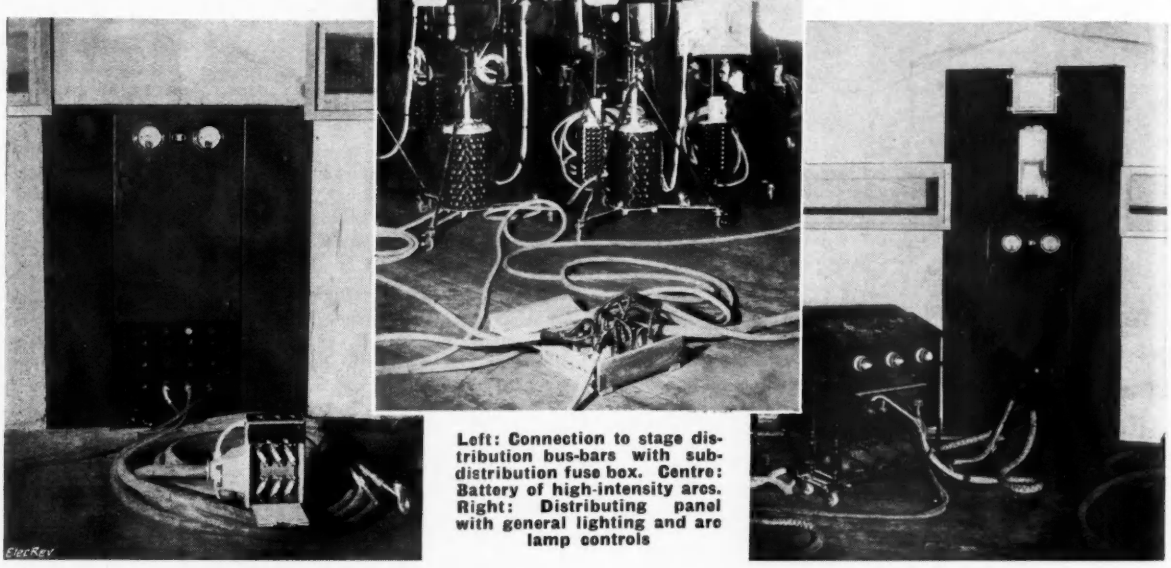
A smaller theatre, 50 by 25 by 20 ft. high, will be used for review only. Four-base equipment will also be employed here, but a mechanical interlock will be used between each complete reproducer and the associated sound-only machine.

The permanent recording channel will be installed in the main amplifier room of the recording building. The amplifiers comprise those for raising the volume of the impulses from the re-recording room and a monitoring amplifier to increase the volume further for operating the loud-speaker system and the noise-reduction amplifier. Other amplifiers will also be installed to operate the loud-speaker monitoring system when working in conjunction with the portable channels. A plug and jack system will permit the sound director (Mr. A. W. Watkins) to select any channel to the loud-speaker in his office with a view to keeping a constant check on the quality of performance.

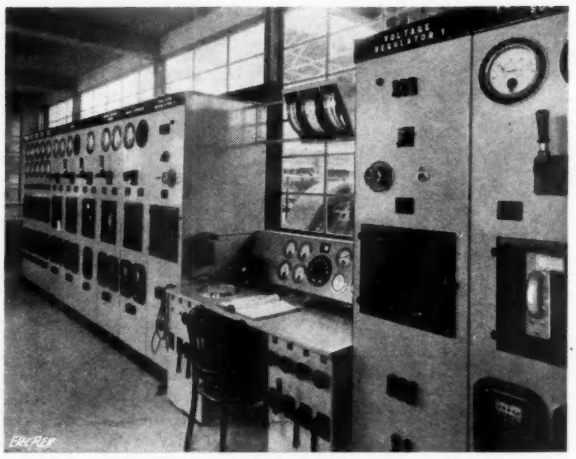
In a separate room will be situated a disc-recording machine, primarily for playback to the stages by any channel. Testing equipment includes a precision variable oscillator, gain-measuring set, and impedance matching panel; test circuits are run to all studios with provision for varying the interconnections. Two three-unit motor generators supplying 110-V d.c. and 220-V three-phase, are to be installed for operating the sound equipment, and 110-V single-phase can be obtained by transformation. Six motor distributor sets, speed-controlled by a d.c. motor, will be provided; all motors running one channel must be electrically interlocked with one of these. A five-panel switchboard for duplicate bus-bars for both a.c. and d.c. has been provided by the Astral Engineering Co. for controlling the motor generators and transformer (illustrated on page 736). The same firm also supplied a three-panel board for charging two 12-V 400-Ah batteries, two 360-V batteries and 12-V portable batteries in four-series circuits from the 220-V mains.

A Light signalling system indicates during recording operations whether everything is ready at each point of control. The provision of "patching" panels (*i.e.*, rows of jacks on which the circuits terminate to permit the quick connection of any circuit to another) introduce complete flexibility in the setting up of various combinations. An interphone system interconnects all operating positions in the studios.

Batteries, both high and low tension, for use in connection with the permanent channel, together with battery charging and distribution equipment, are being installed in separate rooms, and arrangements are in hand for the charging of the batteries required for the portable units. Other apparatus included in the sound-recording studios are light valve stringing and testing appliances. sensitometer and densitometer for control of film processing. Particular attention has been paid to the processing departments, which are said to have been often a weak spot in film production hitherto, and art and "still" sections and eighteen cutting rooms are included in the layout of the studios.



Left: Connection to stage distribution bus-bars with sub-distribution fuse box. Centre: Battery of high-intensity arcs. Right: Distributing panel with general lighting and arc lamp controls



Control desk and switchboard

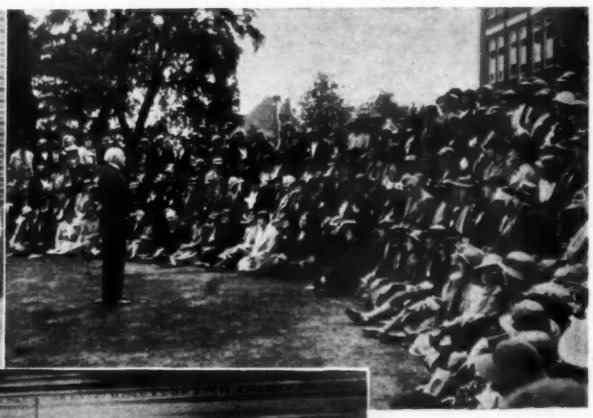
Electricity in the Domestic Sphere

The E.A.W.'s Annual Conference

THE increasing interest and influence of women in electrical matters were much in evidence at the annual conference of the Electrical Association for Women held in London last week, about five hundred delegates being present.

A reception on behalf of the Committee of the London Branch by Mrs. H. Bentham (chairman) and Mrs. Morley New at the Prince's Galleries, Piccadilly, opened the proceedings on Wednesday evening, the annual general meeting being held on Thursday morning at the Park Lane Hotel. In the absence of the Dowager Marchioness of Reading the chair was taken by the Dowager Lady Swaythling, who expressed a hearty welcome to the delegates and paid a special tribute to the work of Miss Caroline Haslett, director, and her staff.

Drawing attention to the Association's most outstanding activities recorded in the annual report, Miss Haslett briefly mentioned the campaign, inaugurated in 1934, for investigating the conditions and needs of the average housewife. This campaign had culminated in the building at Bristol of a model all-electric house for a middle-class family. The London Branch proposed to follow this example by building a house at Edgware and other branches had similar ambitions.



At the Conference of the Electrical Association for Women last week: Top left: Members of the National Executive Committee and others at Christ's Hospital Bluecoat School for Girls, Hertford. Top right: Lord Ashfield, chairman of the Northmet Company, welcoming delegates at Northmet House. The remaining picture shows Miss Caroline Haslett addressing the annual general meeting

To assist the voluntary officers with the ordinary problems which arise in the organisation of a branch, a special conference was held at Hoddesdon, and its beneficial effects are already apparent. The Summer School for Teachers held in Gloucester was attended by 107 students and could have taken twice as many if accommodation had been available. A permanent and definite piece of work has been done by the Association in establishing the electrical housecraft certificate and diploma and there has been a considerable growth in the supply and demand of trained demonstrators. The number of colleges offering facilities for training in domestic electrical housecraft has increased under the encouragement of the Association, affording instruction not only to demonstrators and teachers requiring coaching for certificate examinations, but also to housewives wishing to increase their electrical knowledge.

An invitation to present the women's point of view had been received from the Government Committee established to review the existing organisation of distribution of electricity in Great Britain, while in connection with the Ministry of Agriculture's National Mark Scheme, the E.A.W. had been asked to prepare some of the electric cooking demonstrations.

Eighteen new branches and one new unit have been formed, bringing the total up to seventy-one branches and three units. Special courses for teachers and demonstrators are being appreciated, and area organisers have done a great deal to accelerate the work of the Association.

A scheme inaugurated for the affiliation of schools to the Association has met with considerable success, twenty-eight schools having already affiliated. A school essay competition for which Lady Mount Temple has presented a cup, is to be held in the autumn. The Electrical Housecraft School continues its useful work and headquarters are being visited frequently by people from abroad to learn all about the activities of the Association. A second edition of the "Electrical Handbook for Women" was ready in time for the Conference, and a fascinating fairy tale "The Rays," was published during the year to inculcate the electrical idea in the minds of the very young. A recent aid in extending the activities of the Association has been the purchase of a cine-camera with which it is proposed to compile a library of films dealing with all matters of interest to the E.A.W. At the National Electrical Convention at Bournemouth last June Miss Haslett contributed a paper on "Domestic Electrical Development," and the Association was also represented at many other important functions during the year.

In concluding her references to the annual report Miss Haslett said that the Association owed a great deal to the various other electrical organisations and remarked that it was surprising that it had reached its present prosperous position with so few "growing pains."

The adoption of the report was proposed by Mrs. Hyde, Birmingham, and seconded by Mrs. F. H. Corson, secretary of the Mid-Gloucestershire Branch, who said that the E.A.W. was doing excellent work in blazing trail for their younger sisters and ensuring that electrical facilities were available. The report was adopted unanimously. On the proposition of Lady Mount Temple, past president, and Mrs. A. MacWhirter, chairman of the Cardiff and District Branch, the accounts and balance sheet, presented by Lady Moir, hon. treasurer, and Miss G. Sharp, were similarly approved. The retiring members of the Executive Committee were re-elected, together with Mrs. Garrard, of Birmingham, on the proposal of Mrs. C. H. Yeaman, secretary of the North-West Midlands Branch, seconded by Mrs. A. E. Liddell, chairman of the Glasgow Branch. Approval was given to the co-option during 1935 of area representatives to the Executive Committee from the Central England, S.W. England and S. Wales, and S.E. England Areas.

A letter read by Miss Haslett from Mrs. A. J. Newman said that the Bristol and District Branch was looking forward to the holding of the Conference in Bristol next year. On account of the Coronation it is apparently the general wish that the Conference shall be held before May, but the matter is being fully considered by the Executive Committee.

In accordance with the policy of the Association to launch campaigns from time to time Lady Swaythling proposed a resolution aiming at raising the status of domestic workers. It is proposed to hold in the autumn, probably in the elec-

trical showrooms throughout the country, simple classes at which domestic workers shall be given a rudimentary knowledge of domestic electrical housecraft and appliances. Following a simple practical test successful candidates will be awarded the "E.A.W. Certificate for Homeworkers." Lady Swaythling declared that if the prejudice against domestic work could be overcome the shortage of servants would decrease as their status was improved.

In supporting the motion, Councillor Mrs. Gregory, of West Ham, said it was now impossible to induce girls to become domestic servants. They preferred to take up inferior positions elsewhere. Domestic service was the most honourable profession since it prepared girls for their usual ultimate duties as housewives and mothers. She looked forward to the day when education authorities would realise that it was necessary to fit girls for the most suitable jobs, and make domestic service a professional career.

A few of the distinguished persons at last Friday's ball

Left to right (seated): Mrs. J. M. Kennedy, Catherine, Countess of Westmorland, and Councillor Mrs. Gregory. Standing: Mrs. Dalton, Mr. J. C. Dalton, Mrs. Cramb, Mrs. Sherrard, Mr. A. C. Cramb, Mrs. Vignoles, Mr. Sherrard, Mrs. Morley New, Mr. J. M. Kennedy, Mr. Herbert Morrison, Mr. C. G. Morley New, Mrs. Ll. B. Atkinson, Lt.-Col. W. A. Vignoles, Mrs. Joseph and Miss Haslett.

Mrs. F. W. Lawton, of Sutton Coldfield, gave details of an experimental course on domestic electric service held in her area. There had been prejudice among mistresses, she said, on the ground that servants would meddle with the appliances, but this had now been overcome and four lectures had already been given with excellent results. Mrs. A. J. Newman believed that the proposed scheme would bring about a better understanding between mistresses and maids, and would eventually lead to its being possible to pay higher wages with less actual cost. Mrs. G. Z. de Ferranti, vice-president, claimed that it was the most important work the Association had done and suggested that the next step was to teach the mistresses. Others who spoke in favour of the resolution included Lady Mount Temple, Miss McLean (Harrogate), Mrs. Mathias (Wallington), Mrs. Crowther and Mrs. Kay (Sheffield), Councillor Miss Walter (Worthing), Mrs. Garrard (Birmingham), Mrs. Cole (representing the National Council of Girls' Clubs), and Mrs. M. Carter (a lady cook). The resolution was carried unanimously.

Over six hundred were present at the luncheon following the meeting. Margaret Lady Moir, immediate past-president, took the chair. In a witty, provocative speech Mr. St. John Ervine proposed the toast of "The Social Significance of Electricity." The development of electricity, he said, had come with remarkable rapidity and sixty-six years of compulsory education had proved valueless in bringing people up to the present standard of scientific progress. Because housework had been made so easy the science of cooking had been lost. To-day men married not wives but tin-openers. He believed in a world with the greatest number of people doing the greatest number of things, but the whole tendency of modern progress was to make men all alike. The time would come when the world would demand, not labour-saving machines, but labour-making machines, since with no work to do one lost the zest for it.

These aspersions on the present generation were refuted in a brilliant speech by Mrs. Mary Agnes Hamilton, a governor of the British Broadcasting Corporation, who declared that cooking to-day was better than ever before. If things were worth while, it must be possible to make them accessible not to the few but to everybody. Work was a necessary evil, but the less of it we had the better, and electricity was capable of releasing the housewife from it.

In proposing the toast of "Electricity in the Service of the Home Worker," Miss Violet Markham, chairman of the Ministry of Labour Central Committee on Women's Training, referred to the Association's scheme for improving the status of domestic service and said that the reasons for the unpopularity of this class of work were the bad conditions of work and pay in the past, the greater restrictions regarding leisure, the precariousness of employment, and the social stigma usually attached to the work.

In reply, Mr. R. P. Sloan, member of the Central Electricity Board, stated that the Association was playing an important part in showing how electricity could be used to best advantage. The more electricity was appreciated the more demands would be put on it. Dr. Ferranti's statement seven years ago that a little electrical knowledge was of utmost value to the housewife, was even truer to-day than then. With regard to the growth of the demand in recent years Mr. Sloan said that during the last three years one and three-quarter million new homes had been wired for electricity and at the end of 1935 56 per cent. of the homes in Great Britain used electricity. A little over 250,000 new consumers had been obtained in the first quarter of this year. Ten towns now had over 10,000 electric cookers connected, the increase in electric cooking being largely in the small type of house. Three out of every four domestic consumers could to-day obtain electricity with a running cost of ¾d. per kWh or less, and he anticipated that co-ordination between supply undertakings would make it possible to introduce some more or less standard facilities and charges in all areas.

Thursday afternoon was given up to discussions and talks on the work and development of the Association's various branches, while in the evening Councillor Mrs. Gregory and Mrs. Pender Chalmers, chairman and vice-chairman of the National Executive, received delegates at the Institution of Electrical Engineers on behalf of the National Executive Committee. An address on "The Liberation of the Electron—Its Effect on Everyday Life" (based on his 1933 Faraday Lecture) was presented by Mr. C. C. Paterson (past president, I.E.E.), in a manner which all could understand. Lady Watson, president of the Yorkshire County Federation, took the chair, and Councillor Miss Walter, chairman of the Worthing Branch, proposed a vote of thanks.

Visits to the Northmet Area

By the courtesy of the North Metropolitan Electric Power Supply Co. about 250 delegates spent an enjoyable day on Friday in visiting parts of the company's area by motor-coach. A hearty welcome was given at Northmet House by Lord Ashfield, chairman of the company, who paid a tribute to the excellent work done by the E.A.W. Lady Fisher-Smith, president of the Halifax Branch, proposed a vote of thanks. Re-embarking in the coaches, the delegates then proceeded to either St. Albans, Stevenage, Hertford or Bishop's Stortford and Epping Forest.

There was an excellent attendance at the ball at the Park Lane Hotel, Piccadilly, in the evening. Catherine, Countess of Westmorland, vice-president, received the guests, and everyone was reluctant to leave when dancing came to a conclusion at 2.30 a.m.

Lady Brooke, Miss Haslett, Lady Fisher-Smith and Lord Ashfield chatting at Northmet House

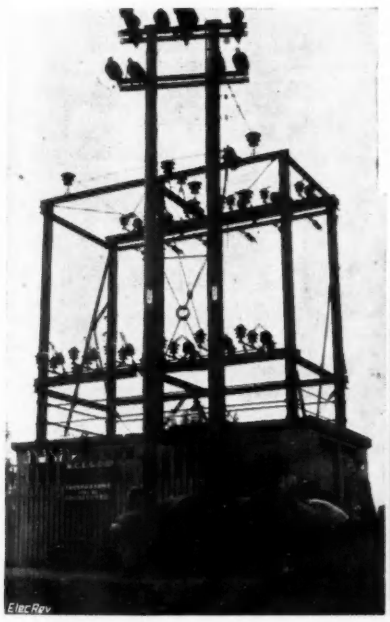
Informal visits to the Building Centre, the Lighting Centre, the E.L.M.A. Lighting Service Bureau and the Housing Centre concluded the Conference on Saturday.

I.E.E. Transmission Section

Visit to Cheshire

ACCORDING to custom, members of the Transmission Section of the Institution of Electrical Engineers and their ladies spent their one-day summer outing in the chairman's area, Mid-Cheshire, on Friday last week. Travelling by rail and road to Winsford, the party was thence conveyed by motor-coaches to the Meadowbank works of the Salt Union, Ltd., where they inspected a rock salt mine that was opened eighty-one years ago. The bulk of the salt is tinted from light yellow to dark red owing to the coloured marl with which it is associated, but occasional pockets of clear white salt of very great purity are found.

Seven years ago the equipment was modernised, and now it is almost all-electric. There are two shafts, each 4 ft. square and 457 ft. deep. About 14 acres has been excavated and the roof, which is between 20 and 30 ft. high, is supported by fifty-two pillars of solid rock, 25 yd. apart and 12 yd. square; these are carefully hewed and left standing as the mining proceeds. The temperature at the bottom is 54 deg. F. all the year round, the maximum variation not exceeding 1 deg. F. There are no deleterious gases, and the natural ventilation is surprisingly good, the mine being also quite dry.



The winding engine, by Walker Bros. (Wigan), Ltd., is driven by a "Metrovick" 45-h.p. motor and is provided with the usual overwind gear and an indicator that will, in case of uncertainty, repeat the last signal given. The mine is electrically lighted throughout, the actual working face being floodlighted with fittings suspended from the roof. The roofing is undercut at the top and bottom by a Sullivan "Ironclad Longwall" machine with a 48-in. jib, which is driven by a 30 h.p. motor. The machine cuts at the rate of 4.5 to 9 in. per minute by means of a toothed chain, salt-rock being some 40 per cent. harder than coal.

After undercutting, slanting holes are drilled in the face by a 1.5 in. Ingersoll Rand rock drill, and the rock is blown off by "shots" of black powder; charges of from 0.5 to 2 lb. dislodge up to 20 tons at a time. After the blasting operation the roof is dressed with a pneumatic "Hardy-pick." The lumps of rock are loaded into tubs and drawn by a 20-in. gauge battery electric locomotive (Wingrove & Rogers, Ltd.) to the shaft bottom, whence they are wound to the top. A battery-charging outfit for the locomotive is situated underground at the foot of the shaft.

The salt mined is either sold in lumps or is passed through a Blake Marsden jaw crusher, Christy & Norris disintegrators and suitable screens, being thence transported by Sturtevant conveyors and elevators and deposited on to a rubber belt conveyor (Greengate & Irwell Rubber Co.) which discharges it direct into ships or barges on the River Weaver that communicates with the Manchester Ship Canal.

Common salt is manufactured also at the Winsfield works by the evaporation of natural brine. The brickwork fire flues are extended beyond the trough-like "pans" in order that the "waste" heat may be utilised in the drying rooms; centrifugal drying has recently been introduced. Brine which has been carefully purified beforehand is also evaporated in vacuum pans, heated by exhaust steam from the works power plant which is finally condensed. Motor driven stirrers assist circulation, other accessory plant comprising elevators and conveyors, filters, separators, vibrating screens, rotary dryers, &c.

From the salt works the visitors were driven to the Middlewich (Croxton Lane) sub-station of the Mid-Cheshire Electricity Supply Co., Ltd., which is of the 33-kV to 400/200-V type, combining a 33-kV duplicate line terminal structure carrying air-break isolating switches for the lines and air-break switches and fuses for the transformers. The switches are all operated from inside a brick-built sub-station (forming the base of the structure) which is used for l.v. distribution; the weight of the building also stabilises the structure, so that no stays are necessary.

The sub-station is at the moment provided with two transformers, one of 100 kVA used for summer supply in the town, and the other of 200 kVA, 33/0.6 kV, for dealing with a 140-kVA condenser and the 220/380-V system through an auto-transformer. The condenser compensates for low power-factor due partially to power load from a near-by silk spinning mill. The sub-station gear is now to be extended to provide 6.6 kV for a loop main going north to connect through to the Knutsford system.

A short 33-kV line with a pole type isolating switch feeds the silk mill, terminating at an outdoor sub-station of two 350 kVA, 33/0.4 kV transformers, a novel feature being the use of outdoor current and potential transformers, since the agreed basis of charge is at 33 kV.

During the afternoon drive a halt was made at Lower Peover Church, where the Mid-Cheshire Co.'s mobile trailer fitted out as a demonstration kitchen provided refreshment.

The Middlewich sub-station of the Mid-Cheshire Electricity Supply Co., Ltd., and (right) the mobile trailer demonstration kitchen from which refreshments were served

Some of the overhead lines seen during the tour are fitted with glass insulators. Others are of special construction to the design patented by Mr. W. Fennell, the aim being to facilitate the safe use of h.v. lines along roads and near houses in place of the usual l.v. method of distribution, and to provide compound lines. This system is adapted for both single- and three-phase h.v. lines, but most of it is single-phase. In the latter case there is only one live wire (which is centred above the earthed return) and an earth wire, which support special cross guards, two, or sometimes three, to a span. The earth wire is usually used as the return for the l.v. circuit, which is placed under the earth and earthed return and is protected by the cross guards in case a h.v. line breaks. With this construction duplicate h.v. suspension is not necessary along roads, and one set of poles only (that for compound lines, *i.e.*, combined h.v. and l.v. lines) is required in villages and ribbon developments. In consequence, as h.v. is near to all consumers, it has been possible to supply cookers, water heaters and sterilisers in rural areas without difficulty so far as voltage regulation is concerned. Also, owing to low capital outlay, charges are the same in the country as in the towns, as the rural overhead supply generally shows the same margin of profit as the more expensive town underground supply.

Tea was served at the Marbury Hall County Club, Col. J. A. Saner, chairman of the Mid-Cheshire E.S. Co., presiding. Dr. P. Dunsheath, chairman-elect of the I.E.E. Transmission Section, expressed the visitors' appreciation of the tour. In reply, Mr. W. Fennell, general manager and engineer, remarked that the Mid-Cheshire Co. was one of the few which had a co-partnership scheme whereby every employé received a bonus based upon the dividend paid to shareholders.

Electrical Fair Trading

Detailed schedules and tables of discounts now available

CLAUSE 48 of the Electricity (Supply) Act, 1926, which gave general powers to electricity supply authorities to sell fittings and appliances, also provided for the setting up of a committee representative of the various branches of the electrical industry to "determine any question which may be raised under this section as to the recognised retail or trade prices of any electric fittings and shall advise and assist the persons concerned as to the method of giving effect to the provisions of this section." The result was the formation of Committee D which, after many unsuccessful attempts to regulate trading conditions, came to an end in 1933.

The need for some form of government persisted, however, and soon after the winding-up of Committee D it was announced that an Electrical Fair Trading Council had been formed with the object of regulating business as between electrical manufacturers, wholesalers, retailers and electricity supply authorities "so as to ensure that the function of each was defined and understood and that each received the fair reward of his labour, to the end that equity and fair dealing might prevail throughout the industry, that the public should be well served and the cause of electricity advanced." The Council comprised representatives of the B.E.A.M.A., the E.C.A. of Scotland, the Electric Light Fittings Association, the National Electrical Contractors' Trading Association (an allied body of the E.C.A.), the Electric Lamp Manufacturers' Association and the Electrical Wholesalers' Federation. Later, representatives of the Cable Makers' Association and the Accumulator Manufacturers' Association became members.

Early in 1934 the Council circulated to the industry a draft Fair Trading Policy which it proposed should be put into operation for a trial period of twelve months pending the setting-up of permanent machinery. This set forth the classes of electrical products affected and defined the terms "electrical manufacturer," "supplier," "electricity supply authority," "electrical contractor," "electrical retailer," "recognised user," and "special large buyer." Certain standard discounts were recommended and the relation between the full trade terms and terms to be allowed to recognised users was stipulated.

The policy was to be put into operation when "an adequate number of manufacturers, wholesalers and contractors" had signed an undertaking to adopt it. In its first annual report the Council said that hundreds of firms had signed the acceptance form but it was still unable to fix a date.

Now, as a result of criticisms of, and suggestions regarding the provisional code, a revised and amplified policy has been issued, and the Council says that "although it has proved impossible to introduce the policy as a definite obligation, the Electrical Fair Trading Council earnestly recommend it for voluntary adoption by the electrical industry in the belief that the acceptance of a recognised and authoritative code of trading practice in place of the existing undefined and uncontrolled conditions would benefit the electrical industry."

The Council says that it will continue to function in an advisory capacity and will be available for consultation or reference in respect of any problems connected with trade questions appertaining to the policy.

After detailing the aims and constitution of the Council the new policy defines the various terms involved. Electrical manufacturers and electricity supply authorities are simply defined. An electrical wholesaler is a person (or persons, firm or company) whose main business is wholesale distributing; who carries adequate stocks of electrical products at his premises for supplying to electrical contractors, retailers and recognised users; who does not cater for direct sales to the public without the recognised trade reservation; and does not carry out installation work. A "supplier" is a person, etc., not being an electrical manufacturer or wholesaler, who is engaged in selling to the trade and undertakes the same obligations as an electrical manufacturer or wholesaler.

An electrical contractor is a person, etc., with suitable premises and equipment principally engaged in the business of selling and installing electrical products.

An electrical retailer is a person, etc., with shop or showroom premises and equipment suitable for a retail trade or equivalent facilities for re-sale and who carries a reasonable stock of electrical products.

A "special large buyer" is a person, etc., whose name is included in a list which it is intended to issue. Pending the preparation of this list any person, etc., permanently employing a staff of electricians of not less than one supervising electrical engineer and two journeymen electricians, and whose annual purchases of electrical material and apparatus are reasonably sufficient for the full-time employment of such staff, shall be eligible for inclusion in this category. It is also intended to issue an "Electrical Register" containing the names of recognised users, *i.e.*, any persons, etc., whose business is of such a nature as to give permanent employment to one or more journeymen electricians, engaged wholly on the installation and/or maintenance of electrical products. Pending the preparation of this register any person conforming to this requirement shall be acknowledged as a recognised user for a period of twelve months from the date of the issuance

SCHEDULES TO THE ELECTRICAL FAIR TRADING POLICY.

Schedule No.	Table of discounts (per cent.).				
	Electricity Supply authority.	Electrical Contractor.	Electrical Retailer.	Special Large Buyer.	Recognised User.
(1) Electric wiring accessories (adaptors, blocks, boxes, ceiling roses, connectors, cut-outs, lampholders, plates, socket outlets and plugs, switches)	25	25	25	25	15
(2) Electric light fittings (ornamental and decorative types):					
Category (i): Bracket and wall fittings, bronzes, ceiling fittings, crystal fixtures, electroliers, floor, table and desk standards, pendants, silk and other decorative shades, glassware (plain or fancy) bowls, globes, reflectors, shades	33⅓	33⅓	33⅓	33⅓	25
Category (ii): Showroom selection orders*	25	25	25	25	15
(3) Electric light fittings (industrial and commercial types):					
Category (i) includes sheet-metal and cast fittings, with or without glassware; vapour-, gas- and flame-proof fittings; ship fittings (other than decorative); commercial fittings, comprising standard types of utility fittings; and accessories for the foregoing	33⅓	33⅓	33⅓	33⅓	25
Category (ii): Colour matching units and floodlight fittings...	25	25	25	25	15
Category (iii): Fittings for the lighting of publicly-owned streets or roads	No list price or discounts—net prices only to be adopted.				
(4) Electric light fittings accessories (with the exception of material specifically covered in Schedules 1, 2 and 3) ...	33⅓	33⅓	33⅓	33⅓	25
(5) Heating, cooking and domestic electrical appliances:					
Category (i): Boiling plates and rings (domestic), bronchitis kettles, chafing dishes, cigar lighters, breakfast cookers, curling-tong heaters, curling and waving irons, egg-boilers, fires, radiators and convectors, floor polishers, fruit juice extractors, geysers, grill boilers, grillers (domestic), hair dryers, hair clippers, hand dryers, health exercisers, hot plates (portable), immersion heaters, irons, kettles, motor-driven kitchen appliances (except as specified in Category (ii)), milk heaters, sterilisers or porringers, drink mixers, domestic mixers, motor-car heaters, coffee percolators, saucepans, sewing machine motors, shaving pots, soldering irons, steamers (domestic), sterilisers, teapots, toasters (domestic), towel rails and heaters, tubular heaters, urns (up to and including 6 gal. capacity), vacuum cleaners, vibrators, waffle plates, warming pads, bottles and blankets, warming plates, wash-boilers	25	25	25	25	15
Category (ii): Dish washers, drying cabinets, ironing machines, washing machines	20	20	20	20	10
Category (iii): Cookers,† domestic sizes (except breakfast cookers), hot cupboards (domestic sizes), storage water heaters (up to 50 gal. capacity)	15	15	15	15	7½
Category (iv): Cookers (other than domestic sizes), urns above 6-gal. capacity	10	10	10	10	List price
(6) Switches (air-break) and distribution fusegear (open type or enclosed in wood, metal or insulated cases), with the exception of tumbler, rotary, turn and push switches (up to 30 A, 250 V) covered in Schedule (1). This Schedule does not cover automatic control circuit-breakers, circuit breakers, contactor-type switches, generator regulators, motor control switches, motor starters and regulators‡...	25	25	25	25	15
(7) Electric bells, indicators and bell materials (including batteries and battery materials), except electric wiring accessories included in Schedule (1)	25	25	25	25	15
(8) Conduit fittings	25	25	25	25	15
(9) Accumulators (stationary batteries) and their parts and accessories	15	15	—	These classes do not apply to this Schedule	

* Where the accredited representative of the contractor accompanies the purchaser to the showroom for selection a further 3⅓ per cent. is allowed.

† The terms to electricity supply authorities for cookers shall be a matter of arrangement between them and the manufacturers.

‡ The policy does not cover house-service gear normally supplied to supply authorities for use on the service side of the meter.

of the Electrical Fair Trading Policy or other agreed period.

Under this heading it is stipulated that manufacturers (or wholesalers in certain circumstances) shall fix list prices for the articles coming within the scope of the policy and that supply authorities, contractors and retailers shall be entitled to a trade discount which is only to be exceeded in the case of special quantity buying terms. Manufacturers and wholesalers shall settle terms between themselves and they shall (so far as is reasonably practicable) sell only to purchasers entitled to discounts.

Supporters of the policy undertake to maintain list prices when selling to purchasers not entitled to discounts and to give only the defined discounts to those authorised to receive them. They also undertake to trade only (so far as is reasonably practicable) with fellow supporters of the policy and to assist them in maintaining the conditions.

The Schedules

The products which come within the scope of the policy are classified into nine schedules (which may be added to subsequently). These schedules are reproduced in summarised form on the opposite page.

In connection with each of the first eight the following conditions apply: Architects and consulting engineers ordering or specifying material covered by the schedule on behalf of purchasers who come within any of the five classes named in the schedule, but not otherwise, may be quoted terms appropriate to such classes. A builder is not entitled to any discount on any material covered by the schedule unless he has an established electrical department with suitable premises and equipment for the business of selling and installing electrical products. Manufacturers of electrical apparatus embodying any material covered by the schedule as component parts on the understanding that such material is re-sold as a part of a complete product (not separately), may be quoted special terms for such component parts only. Government Departments and railway companies (including the London Passenger Transport Board) may be quoted special terms.

In Schedule (5) the following note regarding large building estates, &c., appears:—"For large quantities of inset fires, cookers, wash-boilers and similar appliances, for erection or installation in a number of houses, *and for resale as an integral part of those houses*, quantity terms may be quoted provided that a reservation shall always be made for the electrical contractor; such reservation to be paid to the electrical contractor who may prove himself entitled thereto by having rendered suitable service in the particular transaction."

In the case of the last schedule, which covers stationary accumulator batteries, the conditions relating to architects and consultants are included but there is also a note to the effect that it is customary for accumulator manufacturers to grant a discount of 15 per cent. to the following classes of buyers: Factors who have an electrical department; manufacturers of electrical apparatus; certain makers of gas, oil and steam engines; railway, canal and telegraph companies, dock and harbour authorities and Government Departments; and certain approved buyers who re-sell to the trade and non-trade customers to whom a further discount which varies in amount may be given.

In those sections of the industry where trade agreements are in operation, and where such agreements have been made between associations which are represented on the Council it is understood that they conform, or will conform to the general principles of the policy.

Membership of the Council

The members of the Electrical Fair Trading Council are as follows:—Independent chairman, Mr. W. Finlay, W.S.; representing B.E.A.M.A., Messrs. V. Watlington (vice-chairman) and T. W. Heather; representing E.L.F.A., Messrs. W. T. Dean, E. Barnard, and A. E. Iliffe; representing the Accumulator Manufacturers' Association, Messrs. E. S. New and F. C. Vine; representing the C.M.A., Col. Sir Thomas F. Purves and Messrs. H. D. Roberts and A. E. Tanner; representing E.L.M.A., Mr. C. W. Sully; representing the E.W.F., Messrs. A. Albrecht, A. G. Beaver, and A. B. Wildsmith; representing N.E.C.T.A., Messrs. T. E. Alger, L. C. Penwill, and W. H. Walton; representing the E.C.A. of Scotland, Messrs. J. Allan, W. Finlay, and A. Lindsay.

"Order out of Chaos"

The policy was commended to the attention of the Press at an informal luncheon on Friday last week. Mr. W. Finlay (the "Independent Chairman" of the Council) who was supported by the vice-chairman, Mr. V. Watlington (Director of the B.E.A.M.A.) said that the associations represented on the Council thought that the valuable work already accomplished over a period of many years should be made available and, although the active support of all sections of the industry was not at present forthcoming, they had decided to issue the policy for voluntary adoption in the belief that it would provide a basis on which an agreed policy might be established. It represented an attempt to organise the distribution of electrical products on lines which, while recognising the contribution made by each section, aimed at the elimination of wasteful effort and discount snatching.

The policy did not control prices but was limited to establishing a logical system of discounts for all who were helping efficiently in providing the public with electrical products. It did not attempt to direct purchases in any particular direction but left purchasers entirely free to make their own choice.

It was an attempt to organise order out of chaos. That in the end must reduce distribution costs, ensuring that each link in the chain of distribution did useful work and was remunerated on a proper basis for the work performed. The policy set up a standard both for the good manufacturer and the good distributor of electrical goods, with the aim of producing stable trade conditions. The adoption of the code was voluntary, but it was believed that its inherent merits would gather support and might eventually lead the way to greater co-operation in the problems of production and distribution to the benefit of the industry and those it served.

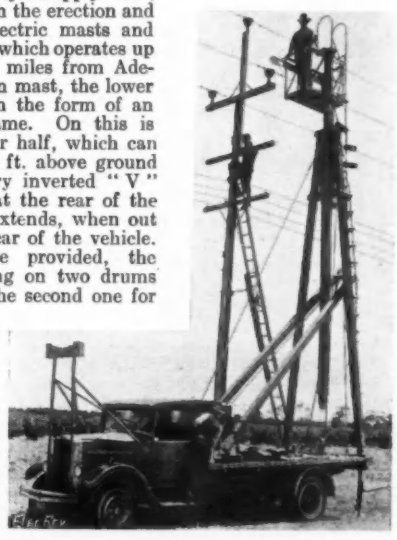
Particularly did the policy keep within the industry those profits which were due to it and which in many cases to-day were, by coercion and bad practice, frittered away. Everybody who subscribed to the policy certainly lost nothing, and was not penalised or handicapped in any way in the carrying on of his business.

Mr. T. W. Heather (one of the B.E.A.M.A. representatives on the Council) then gave a very clear exposition of the main features of the policy. He emphasised the fact that it was a well-thought-out document, not one that had been hastily put together. There was nothing in it to fix or maintain prices; by cutting out waste it would lead to the reduction of prices to the consumer. The position of the ironmonger had been considered and the speaker maintained that this class of retailer was fully catered for under the heading "electrical retailer."

All readers who are interested in the operations of any of the sections indicated are invited to make application for a copy of the 32-page foolscap document containing the full terms of the Policy, to the Secretary, Mr. Felix A. Rogers, Electrical Fair Trading Council, Kern House, Kingsway, London, W.C.2. This will be supplied to approved applicants without charge; further copies will be charged for (6d.).

A Novel Australian Tower Wagon

UNUSUAL equipment has been provided on the platform of a Leyland "Cub" motor lorry recently supplied to the Adelaide Electricity Supply Co., Australia, to help in the erection and maintenance of electric masts and wires. The truck, which operates up to a radius of 150 miles from Adelaide, has a wooden mast, the lower half of which is in the form of an inverted "V" frame. On this is mounted the upper half, which can be extended to 42 ft. above ground level. An auxiliary inverted "V" frame is pivoted at the rear of the driver's cab and extends, when out of use, over the rear of the vehicle. Two winches are provided, the main one operating on two drums for hoisting and the second one for the rope stays. The auxiliary frame is first raised to an angle of about 45 deg., after which rope stays from the frame to the rear of the chassis prevent further movement; the main frame is then hoisted to a vertical position. To raise the central rising mast with its caged platform through the guides in the frame the second drum on the main winch is brought into operation; when the mast is fully raised, the rear of the lorry platform is supported on two jacks, which can be used to swing the cage nearer or further from the line that is being handled. The cage itself, which is rotated by a worm drive arrangement to bring its long side parallel to the line, is reached by climbing spikes in the lower frame and a rope ladder on the upper frame.



Work in progress on the overhead lines of the City of Adelaide Electricity Supply Company's system

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

A Contractor's Plea

I was interested in the article "A Contractor's Plea," which appeared in your issue of May 1st, in which Mr. J. Bland casts some doubt upon the value of tests made with a "Megger" insulation tester. Such doubt seems to destroy the foundation upon which the practice of electrical engineering has been built up in this country! I agree that a test with a "Megger" is not the only one that should be carried out, but I maintain that it still remains the most important test.

There are really only two types of faults in an installation: (1) Breakdown of insulation resistance; and (2) discontinuity of the conductor; although if one of these faults develops, it frequently happens that it causes a fault of the other type to develop also. If therefore a satisfactory test of insulation resistance is obtained, and if the conductor resistance of every circuit is measured and a satisfactory result obtained, the installation must be in perfect order.

An installation, however, does not always remain in the same condition, and if it is to be maintained satisfactorily, periodical tests should be made to see if faults are developing.

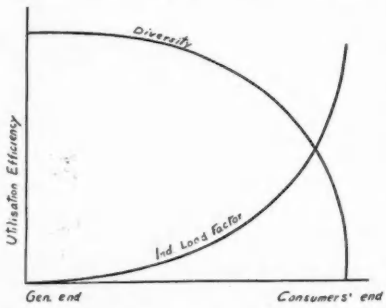
It is because of this possibility of faults developing after an installation is completed, tested and passed as satisfactory that the lead sheathing or conduits should be continuous and should have a low resistance so that fuses will blow when a fault occurs. This involves a further test before an installation can be passed as satisfactory.

It will be seen, therefore, that in an installation three things are important:—(a) Insulation resistance; (b) continuity of the conductor; and (c) continuity of the earthing system. Each of these should be measured and the result recorded, and because the insulation may deteriorate, systematic tests of insulation resistance should be made at regular intervals.

Chiswick, *May 15th.* W. A. VIGNOLES.

Is the Hopkinson Tariff Valid?

In his article on "Diversity and Load Factor" in your issue of April 17th, Mr. D. J. Bolton talks of the "little tin god" of consumers' load factor, but apparently falls mute before the Moloch of the Hopkinson principle. Is this principle as sound as it appears? Doubtless it is of assistance in obtaining an analysis of the influences of standing and running costs, but is the next step—that of applying precisely the same principle to the consumer—as logical as it would appear? Mr. Bolton states that although the ratio of standing to running charges is over forty to one, the ratio generally applied in tariffs is ten to one. The reason for this discrepancy is, as I see it, that the supply authorities are literally ashamed to apply the higher ratio, sub-consciously realising that it is due to some shortcoming on their part. The forty-to-one ratio is due to a failure to recognise the importance of aiming at full utilisation of plant.



The conception of utilisation efficiency may help to clarify the rather confusing reciprocal relationship which Mr. Bolton sees between "lump sum" and individual load factor. A supply undertaking, for purposes of illustration, can be divided into two principal parts, generation and distribution. What may be called their intermediate or separate functions are very dissimilar. If consumers provided their own distribution as a co-operative organisation, the generating management would aim at inducing consumers to so diversify their demands as to achieve a level load curve. At the distribution end, utilisation efficiency indicates (with other than 100 per cent. individual load factor) that it is only in the consumers' service that the full effect of load factor influences utilisation, and, incidentally, the service is the individual consumer's only fixed charge liability. Immediately the consumers' load enters the first main, individual load factor becomes less important and diversity becomes more and more important until the generating station is reached, as roughly represented in the above figure.

Mr. Bolton, in developing his theory of diversity, seems to conclude that the whole question is one of probability and that the problem should be laboriously worked out mathematically. The answer would surely be merely the typical station load curve, in which we have a perfect answer to the ultimate effect of the sum of individual demands. A high peak in the station load curve shows that there is an aggregate disposition on the part of consumers to synchronise demands. If this is unchecked (the two-part tariff has strictly no effect in correcting this tendency) we have poor utilisation not only at the generating end but over the greater part of the distribution. Conversely, the encouragement of demand over low-load periods is similarly not encouraged by the two-part tariff except indirectly.

The solution, I think, lies in using the typical load curve as a tariff index. It provides a direct means of increasing utilisation efficiency by making time of demand the basis of charge; in fact, the rates per kWh should be infinite and should vary (but not necessarily directly) with the instantaneous typical station load. The object of a tariff should not be to represent costs nor strictly to recover costs, but to encourage full utilisation of plant and the most efficient use of resources, particularly those of an economically irreplaceable character such as fuel.

It seems to me that the trend of daily demand should on economic grounds be made to fall into three main divisions, namely, lighting, power, and heating; these can be made to occupy, quite naturally, separate time-categories. As heat can be stored, a rational tariff should have as its first object the deflection of all heating load from the time-domain of the others.

A fixed-charge tariff in *representing* costs tends towards a condition of stagnation, because the ultimate aim is the recovery of operating charges, and once this is achieved a balance results, the consumer defraying all expenses irrespective of the operating efficiency; it can, in fact, encourage inefficiency. A time-basis tariff on the other hand inherently encourages efficiency and expansion. Such efficiency as has been achieved by two-part tariffs has resulted more from the departure from the "scientific" form than from strict adherence to it. H. H. MANSON.

Nassau, Bahamas, *May 1st.*

Brushgear

In the course of arranging material for my article "Characteristics of Brushes," published in your issue of May 1st, I took advantage of Mr. P. Hunter Brown's book "Carbon Brushes and Electrical Machines," and another of his works, for the purpose of checking my own matter. I regret that some of Mr. Hunter Brown's material was incorporated in my article, without due acknowledgement, and I take this opportunity of recording my indebtedness to him.

Glasgow, *May 15th.* FRANCIS G. W. TREE.

Number and Magnitude

While I appreciate that a record of the number of consumers is required by the Electricity Commissioners in Form El.C.32B, I question whether the mere figure is of value.

The department with which I am connected has for a number of years recorded the number of meters issued which I think is a more significant record with respect to the volume of business. For instance, in the "Number of Consumers" one shipyard taking millions of kWh per annum and one small tenement house taking 80 kWh per annum are returned as two consumers, and there are many other such incongruities which obscure the true position.

Even a record of the number of meters issued does not meet the case. In a recent statistical return the number of premises was required and also the number of consumers. The number of consumers returned was considerably in excess of the number of premises, due to the fact that there were two or more consumers in some premises; in fact, in one case there were as many as thirteen separate consumers taking a supply in one large premises.

Would not the term "Number of Premises Connected," classified under private residences, shops, hotels, factories, &c., meet the case? These numbers deducted from the total number of premises in the area would then give the number of premises remaining unconnected to the supply. Perhaps some of your readers will express their views on the matter.

May 18th. INQUIRER.

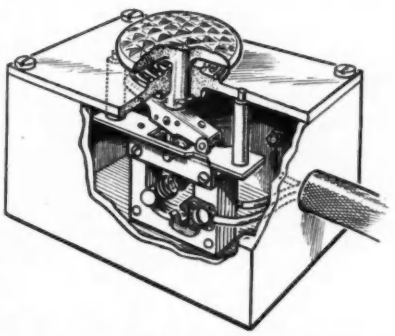
New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

A Quick-action Switch

As a companion to the foot-operated switch described in the ELECTRICAL REVIEW of July 19th, 1935, KINGSWAY ELECTRICAL SERVICES, 54, Bloomsbury Street, London, W.C.1, have introduced a new model (type P.D.10) which is designed on entirely different lines.

It is of the double acting type, pressing alternately "off" and "on." A mushroom plunger mounted in a brass bearing engages with the switch movement, both being attached to the steel lid of a rectangular cast-iron box. By removing the four fixing screws the whole mechanism can be withdrawn for wiring. The standard entry is by a ¾ in. clearance hole at one end, but a bushed entry for flex can be supplied and an earthing terminal is fitted in the side of the case. At 250 V the rating is 5 A, and the company states that the apparatus has been tested to 250,000 double operations without failure.



A constructional sketch of the latest K.E.S. switch

In the form illustrated, the switch is suitable for use as an emergency push switch for either hand or foot operation, but it is also obtainable with a momentary contact action, and is then known as type P.S.10.

An "All-circuit" Tester

A universal testing instrument giving direct readings without breaking the circuit on a.c. supplies is now available from the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2.

It enables the user to obtain direct readings of voltage, current and power factor without breaking the circuit; the power can thus be calculated in watts and in reactive volt-amperes. The tester, which is suitable for use on single-phase or three-phase circuits, comprises an open-core transformer having a secondary winding connected to a moving-coil instrument through a full-wave metal rectifier, and a voltage circuit connected directly to the rectifier through a series resistance. Suitable internal resistances are included and are selected by alternative terminals. Conductors from ⅛ in. to ¾ in. overall dia. can be accommodated. The ranges covered directly are 250 and 500 V and 10, 20, 100 and 200 A. An adjustment is provided whereby the magnitude of the current applied to the instrument for a given voltage can be varied, thus supplying current of constant magnitude and in phase with the line voltage and enabling the power factor to be measured.

The G.E.C. "all-circuit" tester

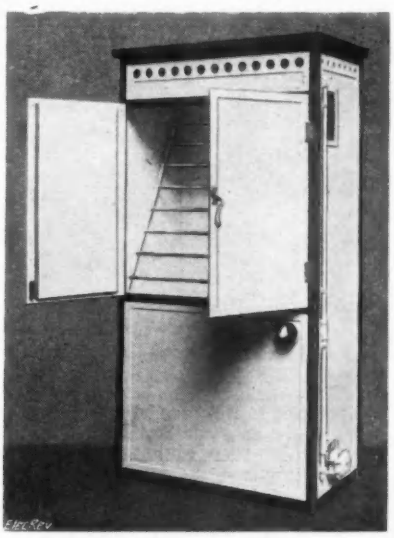
The internal resistance of the voltmeter is 100 ohms per V or 10 mA for full-scale deflection. Current measurements are carried out by placing the open core of the transformer astride the conductor. The principle of the direct measurement of power-factor lies in the fact that it is possible to apply current to the instrument, which is proportional to line voltage and current, singly and in combination. Power or reactive volt-amperes can, of course, be calculated from the usual formulæ. If the load is unbalanced, a mean value of all three current readings (on each main) may be used to give an approximate three-phase power load.

A 5-A Battery Charger

A 12-V accumulator can be charged at 5 A from the new model (V.12/5) battery charger of MESSRS. F. C. HEAYBERD & Co., 10, Finsbury Street, London, E.C.2. It is in a robust, well-ventilated case mounted on rubber feet and weighs 22 lb., measuring 9½ in. by 8½ in. by 7½ in. The charger can be used equally well to give a low-voltage d.c. output for the operation of small motors, model railways or cinematographs, &c. For 6-V accumulators a smaller charger, designed on the same lines as the 12-V model, is available.

Airing and Drying Cabinets

Improved designs of airing and drying cabinets have recently been introduced by MESSRS. BERTRAM BRICE, 42, Castle Hill Road, Hastings. Three sizes are made, namely, a "Minor" model measuring 3 ft. by 3 ft. by 1 ft. and loaded at 1 kW; a domestic model, 6 ft. by 3 ft. by 18 in., heated by a 3-kW element; and a commercial model 6 ft. by 5 ft. by 2 ft., and loaded at 6 kW. Drying is accomplished by the circulation of warm air, ventilation holes being provided at the top of the cabinet, which is designed to condense the steam. The cabinets are completely self-contained, having their own fuses.



The Brice domestic airing cabinet

An Electric Washer with Refinements

A *de-luxe* model of the "Supreme" electric washer has just been introduced by MESSRS. L. G. HAWKINS & CO., LTD., 30-35, Drury Lane, London, W.C.2.

In common with the standard machine, the polished aluminium agitator has three large vanes to give a vertical turbulence, while the ¼-h.p. motor is rubber mounted, self-aligning and fully insulated, being tested to 1,100 V.

The cabinet is of attractive design with rounded edges, being finished in cream and chromium, with the exception of the white porcelain enamelled top, and the wringer is also of new design to match. The rollers measure 12 in. by 2¼ in. and are of semi-soft white rubber. There is a porcelain safety hand guard and an instantaneous roller release. A hand-screw adjusts the pressure of the rollers and the wringer may be rotated and operated in five different positions, while provision is made for the rapid substitution of an electrically-operated ironer.

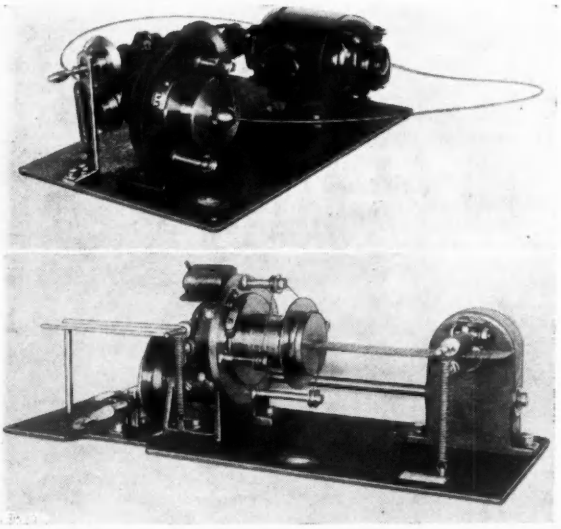
The "Supreme de-luxe" washer

The overall height of the washer is 48 in., the tub measuring 21½ in. by 14½ in. with a capacity of 6 lb. of dry clothes. The total weight of the machine is 198 lb.

E

Element Winding Machines

Motor-driven element winding machines are now being marketed by MESSRS. FRANK WHITELEGG, 35, Union Road, Rotherhithe, London, S.E.16. There is a machine intended for winding short pieces of mica, such as are required for iron elements. It will take strips up to 2⅜ in. wide and all the usual sizes of nichrome ribbon and wire; adjustment can be made for pitches from 0.008 in. to $\frac{3}{16}$ in. The magazine is first filled from the bobbin of wire and the direction of drive is then reversed to wind the wire on to the mica, the wire being pulled off the magazine against a finely adjustable brake. A device is also provided for obtaining extra spacing and to ensure that the wire drops correctly into steps in the mica.



Element winding machine for spirals, and (below) for winding on straight lengths of mica

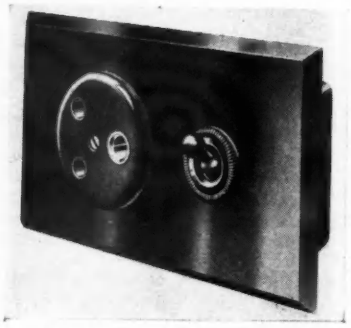
A second machine is available for winding on long straight lengths of mica up to 1¾ in. wide. In this case the wire is taken direct from a bobbin so that longer lengths can be obtained. The mica is fed through by rubber-covered rollers driven through a friction device so that it can be adjusted for any pitch.

Another machine is designed specially for winding spirals on a mandrel. The wire is taken from a bobbin and the mandrel is fed through by means of a geared drive so that close or open pitching can be obtained. The mandrel diameters are from about ⅛ in. up to $\frac{7}{16}$ in., and the wire from about 20 to 35 s.w.g. A round belt transmits the power from the motor to the element winder.

Equipment for making wire-covered asbestos cord elements for blankets, pillows and medical pads can be obtained from the same company.

Flush-mounting Switch-sockets

The exceptional shallowness of a new 3-pin "Tenbyluxe" flush-mounting 5-A switch-socket made by MESSRS. S. O. BOWKER, LTD., Regent Row, Birmingham, saves a considerable amount of time and labour in installation. The box itself measures only $\frac{7}{8}$ in. deep (the average depth of the plaster), while knockouts at the back, top and sides enable it to be used vertically or horizontally, with surface wiring if desired.



"Tenbyluxe" 3-pin flush-mounting 5-A switch-socket

A quick make-and-break switch is incorporated, the semi-rotary action giving a long break. The terminals are of the easy-wiring turret type, and the plug sockets are of B.S.S. standard gauge. The dolly is made of unbreakable "Erinoid."

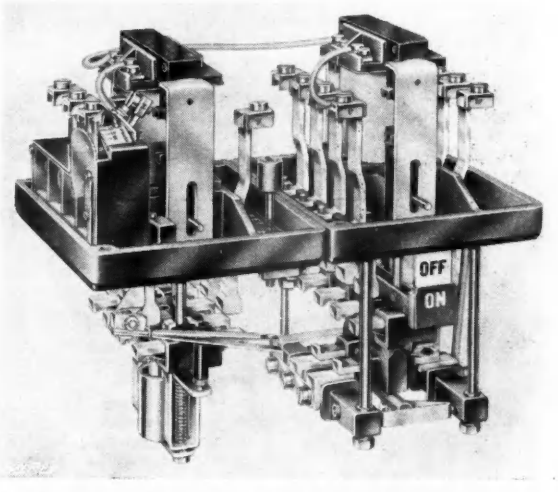
Automatic Motor Control

AN addition to the range of products manufactured by Messrs. J. A. Crabtree & Co., Ltd., Lincoln Works, Walsall, is being made in the form of switchgear for the control of three-phase, squirrel-cage motors with interchangeable components. Two types are available, namely, "D.L." for direct-on line starting up to 15 A at 500 V, and "A.S.D." for automatic star-delta starting up to 25 A at 500 V. They consist in each case of a t.p. oil-immersed switch the movement of which is operated magnetically and controlled by built-in "start" and "stop" push-buttons. An indication of the position of the switch is visible externally and no-volt protection is inherent. The switch is suitable for direct control, but additional remote-control stations can be employed.

For lowering the cast-iron tank only the cover thumb-nuts need be loosened. Separate internal and external earthing terminals are provided. With the A.S.D. type change-over from star to delta is independent of the operator, but the interval can be varied on site in accordance with the rate of acceleration.

Overload release is provided by a unit containing three bimetallic elements (one for each phase) in separate compartments which operate a common trip-bar. The elements are calibrated to function on sustained overloads as low as 10 per cent., but to be inoperative with starting surges up to seven times full-load current, and also to stop the motor within ten seconds in the event of single-phasing. Ambient-temperature compensation is provided.

A conduit box attachment, arranged for top, bottom or side cable entry, is fitted with a detachable front plate to permit the completion of cable runs prior to the fixing of the switch.

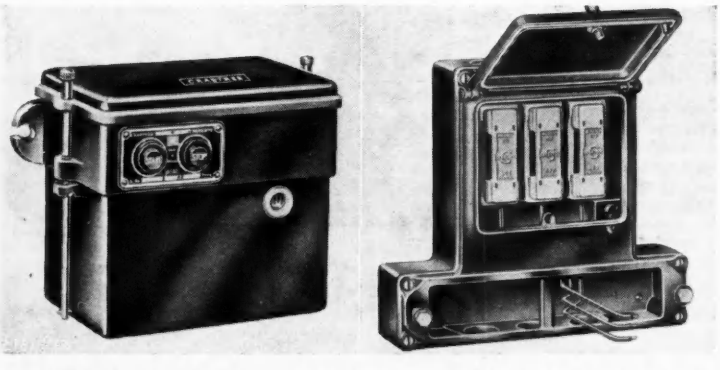


The Crabtree automatic star-delta switch with case removed to show interior mechanism. The overload release can be seen on the left

The fuse chamber, which has similar arrangements for wiring, houses three high-rupturing-capacity cartridge fuses electrically interlocked with the switch to prevent their removal under load. The fusible element is embedded in an inert filler in a ceramic cylinder.

Self-aligning contacts and ample accommodation for examining the cable terminals are provided. Among other features of the new apparatus are the multiple shading rings embodied in the tractive magnet with a view to minimising hum and to provide adequate contact pressure even with a voltage drop of 30 per cent. The coils are connected between phases and can be easily changed to suit altered supply conditions. Similar facility in changing is also claimed for the silvered copper fixed and moving contacts.

Cast-iron sealing chambers for two-, three- or four-core v.i.r. or paper-insulated cables may be mounted at top, bottom, or either side of the control unit with or without filling compound. Brass stuffing glands can be fitted to the end plate for armoured or unarmoured cables or drilled and tapped for conduit.



Left: The fuse chamber with lid fitted with an electrical interlocking device. Above: An exterior view of the automatic star-delta control switch

British Overseas Electrical Trade

Rising exports of transformers

SINCE the beginning of the year the value of convertors and transformers of British manufacture shipped to overseas markets has moved steadily in an upward direction, as is shown by the following figures:—January, £57,049; February, £66,649; March, £97,459; April, £107,963. The April amount was no less than £59,485 above that for the corresponding month of last year, and this improvement was materially responsible for maintaining our electrical exports as a whole at a satisfactory level.

As shown in the accompanying smaller table compiled from information contained in the Board of Trade returns for the month, the total value of British electrical equipment sent overseas was £1,191,843. Compared with April, 1935, the amount was up by £167,392, or 16 per cent., but this improvement was proportionally overshadowed by the rise of 27 per cent. to £342,984 in the case of imports. Furthermore, while exports were less than in March, due to the incidence of Easter (the average per working day in both months was about £49,000), imports rose to the highest amount so far this year. Bank Holidays, of course, do not affect the importation of goods quite so much as exports, but, nevertheless, the continued increase is noteworthy. In March lighting apparatus, electric motors, radio apparatus and small unenumerated goods were all imported to a substantially higher value, but in April radio apparatus only was concerned to any extent, the increase in this classification amounting to more than £49,000 out of the total expansion of £72,870. The position is not improved by the knowledge that our exports of this type were again less than in April, 1935. Whereas, for instance, we imported £36,621 worth of valves more than last year, our exports decreased by £3,025. However, some comfort can be derived from the fact that the increase in imports was substantially confined to one type of goods.

Turning to the analysis of exports, it is gratifying to notice that shipments of telegraph and telephone apparatus are once again increasing. The amounts exported in the four months of this year were as follows:—January, £171,233; February, £108,038; March, £136,077; and April, £146,835. The principal destinations last month (with comparative values for April, 1935, in parentheses) were as follows:—

South Africa, £45,315 (£18,474); Argentina, £18,052 (£7,723); Australia, £17,293 (£21,392); Canada, £529 (£911); other British countries £20,512 (£27,186); other foreign countries, £45,134 (£48,105).

Exports of wires and cables (excluding telegraph and telephone types) during April were above the figures for the corresponding month of last year, although the progressive decline since last autumn has not abated. An analysis of such exports, with comparative figures for the corresponding month of last year in parentheses, is as follows:—

Rubber insulated wires and cables.—South Africa, £29,656 (£23,859); Australia, £23,724 (£21,777); British India, £12,407 (£12,509); New Zealand, £7,369 (£4,678); other British countries, £12,521 (£13,577); foreign countries, £5,574 (£10,397).

Electric wires and cables (insulation other than rubber).—South Africa, £28,221 (£24,803); British India, £17,509 (£12,238); Australia, £17,119 (£13,309); other British countries, £19,676 (£12,847); foreign countries, £8,537 (£21,236).

The accompanying larger table shows the destinations of the four chief classifications of electrical equipment. In the first column half of the items were lower than in April, 1935, the total revealing a comparatively small increase. Shipments to South Africa (+£33,106) and Argentina (+£17,980) expanded most. Exports of generators were down, due chiefly to smaller consignments to South Africa (−£16,373), while motors at £102,474 maintained the better position recorded in March. "Other machinery" reveals the most striking increase (60 per cent.), and here, again, South Africa was primarily responsible with an improvement of £71,006.

EXPORTS AND IMPORTS DURING APRIL

	Exports. April, 1936.	Exports. Inc. or dec. compared with April, 1935.	Imports. April, 1936.	Imports. Inc. or dec. compared with April, 1935.
Submarine telegraph and telephone cables	£2,246	+ £246	*	—
Telegraph and telephone wires and cables (not submarine)	39,657	+ 10,251	*	—
Other insulated wires and cables	182,313	+ 11,083	£19,914	+ £6,396
Radio receivers, not radiograms (excluding valves)	17,496	+ 2,189	21,372	+ 10,814
Radio transmitters (excluding valves)	12,788	− 260	*	—
Radio valves	26,023	− 3,025	45,922	+ 36,621
Other radio parts and accessories	36,537	− 3,214	53,639	+ 2,042
Telegraph and telephone apparatus (other than radio)	146,835	+ 23,044	*	—
Electric carbons	*	—	11,892	− 4,676
Incandescent lamps	49,595	+ 1,914	11,899	+ 3,154
Other lighting apparatus	36,635	− 7,211	28,771	+ 7,756
Primary batteries	11,913	− 371	914	+ 471
Accumulators	29,428	− 5,265	*	—
House service meters	10,573	− 1,936	*	—
Other electrical instruments	18,356	+ 3,270	21,608	− 1,945
Unenumerated electrical goods and apparatus	142,767	+ 14,619	62,257	+ 3,584
Electric generators up to 200 kW	25,999	+ 7,312	*	—
Electric generators over 200 kW	22,534	− 10,574	*	—
Electric motors	102,474	+ 21,135	30,093†	+ 268
Convertors and transformers	107,963	+ 59,485	*	—
Starting and controlling gear for motors	54,340	+ 32,132	*	—
Switchgear	103,393	+ 12,125	*	—
Other electrical machinery	11,978	+ 443	13,848	+ 8,961
Electric vacuum cleaners	*	—	20,855	− 576
Total	£1,191,843	+ £167,392	£342,984	+ £72,870

* Not classified separately. † Not railway and tramway motors.

BRITISH ELECTRICAL EXPORTS DURING APRIL

Destination.	Goods and apparatus, April, 1936.	Inc. or dec. compared with April, 1935.	Electric generators, April, 1936.	Inc. or dec. compared with April, 1935.	Motors, April, 1936.	Inc. or dec. compared with April, 1935.	Other electrical machinery, April, 1936.	Inc. or dec. compared with April, 1935.
Irish Free State	£25,210	+ £3,755	*	—	*	—	*	—
Channel Islands	9,667	− 136	*	—	*	—	*	—
Union of South Africa	162,522	+ 33,106	£2,459	− £16,373	£35,922	+ £11,018	£135,283	+ £71,006
British India	85,905	− 678	5,858	+ 1,306	14,878	+ 1,478	51,048	+ 18,464
British Malaya	23,423	+ 6,178	*	—	*	—	9,638	+ 2,967
Ceylon	6,819	− 4,962	*	—	*	—	*	—
Hong Kong	3,895	− 3,049	*	—	*	—	*	—
Australia	100,380	− 477	10,589	+ 5,284	10,298	+ 3,756	15,818	+ 11,686
New Zealand	51,284	+ 4,320	*	—	3,751	+ 2,191	8,032	+ 2,914
Canada	9,338	+ 1,399	5,994	+ 5,204	4,137	− 334	1,254	+ 27
Other British Countries	16,853	+ 2,036	6,940	− 3,987	12,538	− 2,745	18,055	− 4,821
Sweden	9,642	+ 2,145	*	—	*	—	*	—
Denmark	9,427	− 7,713	*	—	*	—	*	—
Netherlands	8,764	− 9,836	656	+ 539	*	—	838	− 555
Belgium	9,275	+ 1,653	*	—	*	—	*	—
France	19,205	+ 8,177	*	—	*	—	2,013	− 3,240
Portugal	5,138	− 2,545	*	—	*	—	*	—
Spain	4,849	− 571	*	—	*	—	*	—
Italy	1,878	− 264	*	—	*	—	*	—
Greece	1,953	− 1,037	*	—	*	—	*	—
Rumania	637	− 11,059	*	—	*	—	*	—
Egypt	9,622	− 10,353	*	—	*	—	1,205	− 2,516
China	19,672	+ 6,607	*	—	*	—	4,367	+ 1,500
Brazil	15,604	+ 3,811	*	—	*	—	*	—
Argentina	44,989	+ 17,980	*	—	3,218	+ 525	1,658	+ 759
Soviet Union	*	—	*	—	—	− 354	*	—
Other Foreign Countries	77,211	+ 6,847	16,037	+ 4,765	17,732	+ 5,600	28,465	+ 5,994
Total	**£763,162**	**+ £45,334**	**£18,533**	**− £3,262**	**£102,474**	**+ £21,135**	**£277,674**	**+ £104,185**

* Not classified separately.

Mention has already been made of the position of electrical imports. The chief sources from which these were obtained were as follows (figures for April, 1935, in parentheses):—

Electrical goods and apparatus.—United States, £97,973 (£39,963); Germany, £58,815 (£54,340); Netherlands, £41,358 (£53,378); Switzerland, £18,648 (£12,339); France, £11,891 (£10,609); Belgium, £7,649 (£5,254); Austria, £4,063 (£5,485); other foreign countries, £21,367 (£11,393); British countries, £16,424 (£21,210).

Electric vacuum cleaners.—United States, £9,116 (£6,324); Canada, £4,331 (£7,406); Sweden, £2,805 (£3,293); Germany, £747 (£1,484); other foreign countries, £3,813 (£2,924).

So far this year our electrical exports have amounted to £4,800,365, against £4,271,253 in the first four months of last year, representing an increase of £529,112 (13 per cent.). Imports total £1,285,272, against £1,054,217 an increase of £231,055 (22 per cent.).

New Books

Electric Wiring. By A. A. SCHUHLER. Pp. 387; figs. 305. London: McGraw-Hill Book Co. Price 15s.

This is the revised edition of an American textbook of applied electricity primarily designed for vocational and trade classes. It has developed from the instructional notes of a teacher of elementary engineering and deals chiefly with bell, annunciator, telegraph, telephone and light wiring. A great many of the appliances and arrangements described and drawn in clear detail are not in accordance with analogous installation items in England. At the same time, almost any of our students of installation practice, apprentices or operatives, would derive much useful knowledge by carefully working through the thoroughly practical programme detailed in this book.

What the author describes as the "unit system" of training has been adopted. He takes such a subject as bell wiring as a unit and divides it into, say, fifty tasks which are quite likely to occur in practice. In conjunction with the short and clear illustrated descriptions of each task, two or three test questions are set to check the students' understanding of the subject. These are not placed tiresomely at the end of chapters, but occur on every other page.

In the problems set there is no suggestion that any knowledge or application of arithmetic is required beyond the easy reach of a young schoolboy.

The compilation of this unpretentious book on an original plan is to be commended. A similar English work specially designed for wiremen and apprentices is not available, but the simple method of instruction is well worth the attention of teachers of trade classes in this country, for it would be comparatively easy to design courses on similar lines applicable to our own wiring requirements.

Electricity for Boys. By ELLISON HAWKS. Pp. 392; figs. 214. London: Ivor Nicholson & Watson, Ltd. Price 7s. 6d. net.

The expansion of electrical science and of its applications to everyday activities renders more and more difficult the task of presenting with sufficient clarity, yet with the necessary brevity, an elementary exposition of electrical phenomena. In the volume under review the author writes in a readable manner and with unflagging enthusiasm.

Admirable descriptions are given of electrical machines without undue use of technicalities, and a very wide field is skilfully covered. The illustrations are well-chosen, and the simple experiments are described in detail. A chapter of exceptional interest deals with electricity in locomotion, sections being devoted to tramway and trolley-bus systems and electric railways. The chapter includes descriptions of the automatic safety devices on the London Underground Railways, and of the most novel development, that of the Railplane system of electrical transport in which cars are suspended from a rigid overhead structure at the standard bridge clearance in this country of 16 ft. above ground level.

Admirable and simple summaries of the fundamental features of wireless telegraphy, radio receivers, television and X-rays are given.

The Development of the Parsons Steam Turbine. By R. H. PARSONS. Pp. 420; figs. 341. London: Constable & Co. Price 42s.

The modern designer or operating engineer, with the latest products of the metallurgist at his disposal, is prone to overlook the tremendous disadvantages which had to be circumvented by the pioneers of steam-turbine engineering. The author of this work has recorded not only the development of the machine itself, but also the story of the late Sir Charles Parsons's genius for overcoming difficulties and of his ability to look ahead of contemporary requirements. The book deals with land turbines, and is divided into two parts. The first part discusses turbo-generating machinery and the second, industrial turbo-machinery. The gradual evolution of the Parsons turbine is effectively traced by text and illustrations (ranging from a photograph of the first Parsons steam turbine to a sectional drawing of one of the Dunston 50,000-kW sets) and the landmarks in its history are clearly noted.

Because of distortion and related troubles resulting from the use of cast-iron at the high-pressure ends of turbines supplied with superheated steam, for instance, it was decided to utilise cast-steel. The first machine to be thus constructed was the high-pressure cylinder of the 4,000-kW set designed for the Bankfoot station of the Newcastle-upon-Tyne Electric Supply Co. in 1910, the practice being followed in all subsequent turbines. Incidentally, the Bankfoot set was the first land installation in which the h.p. and l.p. turbines were arranged to drive individual generators.

The now familiar end-tightened blading was introduced as long ago as 1912, and resulted in an immediate gain in efficiency of from four to five per cent. The development of the conical form of blading is interesting to trace, the tendency to adopt this construction becoming more and more pronounced as manufacturing and other difficulties were overcome, until the culmination was reached in 1924 in a single-cylinder machine for Derby power station. The re-heating of partially expanded steam (which until quite recently was regarded as very advanced practice) was tested by Sir Charles Parsons in 1900. Owing to the conditions of the experiment, however, the advantages were considered to be negligible, and re-heating was, therefore, abandoned until 1921.

In the second section of the book an account is given of the evolution of Parsons's turbo-compressors, &c. Another development, sometimes regarded as modern, namely, the turbo-generator arranged with its condensing appliances on a single floor level, was anticipated by the Parsons Co. when it constructed a "Uniplane" set of 32 kW for a London firm in the 'nineties.

We recommend this book to the student engineer anxious to acquire a sound knowledge of steam-turbine evolution; to the operating engineer desiring to have at hand a review of past and present practice; and to the designer as a possible source of inspiration.

The Testing of Internal Combustion Engines. By S. J. YOUNG and R. W. J. PRYER. Pp. 200; figs. 87. London: English Universities Press, Ltd. Price 8s. 6d. net.

Despite the many and varied forms in which it is used, and the enormous amount of research and investigation which has been expended upon its design, construction and operation, the internal combustion engine is still to a certain extent a machine of moods. Hence, it is of far greater importance that extensive tests should be carried out before the acceptance of a petrol or heavy-oil engine than, say, for a steam turbine. This is generally recognised amongst engineers, although the literature covering the testing of internal combustion engines is meagre.

In this book are set forth the various tests whereby one can begin to understand some of the characteristics of the i.c. engine. It is built up on material which the authors have accumulated in the course of their work in the laboratory of one of our leading technical colleges, and while, as a consequence, it does not deal with the testing of large engines it possesses the compensating advantage that the majority of the tests are fairly easily performed, and much of the apparatus required can be readily made by any engineer who has the equipment of the average technical college workshop at his disposal. The tests described are those for b.h.p., i.h.p., and fuel consumption, and considerable space is devoted to the various types of brakes, indicators, and measuring apparatus available.

An example of the up-to-date character of the book is the description given of the cathode-ray indicator for high-speed engines. In addition to what may be termed the usual routine and acceptance tests, attention is drawn to comparative tests for ascertaining the effects of changes in setting or design as well as research tests and educational tests for investigating or illustrating the various theories underlying the operation of i.c. engines. With these objects in view chapters are given on the determination of heat losses, measurement of air consumption, manifold efficiency, and such-like problems. Throughout the book tabulated results of actual experiments are given as well as numerous graphs obtained by plotting these results one against the other. The text has been carefully written, the diagrams and graphs clearly drawn, and we can echo the opinion expressed by Mr. Ricardo in a foreword that the book cannot fail to be extremely valuable both to the professional engine tester and to the student.

* * *

Shorter Notices

"Radio Engineering Handbook," by K. Henney. (Second edition.) Pp. 851; figs. Price 30s. net. "Radio Receiving and Television Tubes," by J. A. Moyer and J. F. Wostrel. (Third edition.) Pp. 635; figs. 387. Price 24s. London: McGraw Hill Publishing Co., Ltd.

"Foundations of Technical Electricity," by E. Mallett and T. B. Vinycomb. Pp. 188; figs. 92. London: Sir Isaac Pitman & Sons, Ltd. Price 5s. net.

Parliamentary News

(By our Special Reporter)

IN the House of Commons on May 18th Mr. Ede asked the Minister of Transport when he expected to receive the report of the Committee on the Distribution of Electricity, presided over by Sir H. McGowan.

Capt. Hudson said that the Minister had now received the report.

Trolley Buses for Manchester

The House of Lords Committee on Unopposed Bills had before it on May 14th the Manchester Corporation Bill. Lord Onslow presided. By this Bill the Corporation seeks authority to put trolley buses on four routes in the city and on routes in Urmston and Stretford, and also to run trolley buses on any tramways which it owns or operates on lease either in or outside the city. Formal evidence having been given in proof of the preamble the Bill was ordered to be reported to the House for third reading.

Bills Advanced

In the House of Commons last week the Colne Valley and Northwood Electricity Bill was agreed to on report, and the London Passenger Transport Bill received its third reading.

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

Employment in April

Employment during April in the engineering industry continued to improve in all sections, and in all administrative areas except Northern Ireland. It was fair on the whole, being good in electrical engineering. The *Ministry of Labour Gazette* states that the number of unemployed in the engineering industry decreased by 4,420 to 84,776, and the percentage from 9 to 8.6 (12.3 per cent. in April, 1935). In the electrical engineering section the number of unemployed was 4,598 or 4.9 per cent., as against 5.3 per cent. in March and 7.2 per cent. in April, 1935. The unemployed in the electrical wiring and contracting industry numbered 4,440, the proportion falling from 13.6 to 12.6 per cent. (14.6 per cent. in April, 1935). In the electric cable, apparatus, lamps, &c., group the number of unemployed was 11,655, the proportion decreasing from 9.4 to 8.2 per cent. (10 per cent. in April, 1935).

Electricity on the "Ovaltine" Farm

We recently had the opportunity of seeing to what extent electricity is now used on the King's Langley poultry farm of Messrs. A. Wander, Ltd., makers of "Ovaltine." A laying flock of at least 50,000 pullets is maintained, and the 300 acres of farmland are divided into commercial and pedigree sections. The chicks are hatched in 10,000 or 5,000-egg incubators (Buckeye Incubator Co.) fitted with automatic humidity registers. Last season, with hatches throughout the year, the proportion of chicks produced from fertile eggs was 85 per cent. and from all eggs set about 75 per cent. Fertility tests are carried out by a special G.E.C. lamp, a 300-W daylight lamp being employed for sexing after hatching. "Cadillac" vacuum cleaners ensure scrupulous cleanliness in all buildings. In the commercial section the chicks, after hatching, are placed in the battery house (capacity 10,000), where they are given a twelve-hour day throughout the year by means of electric lighting controlled by hand dimmers. On the Pedigree Farm, instead of a battery house, separate small unit houses for eighty chicks are provided, with outside runs. These houses are equipped with electric hovers consisting of two G.E.C. 120-W tubular heaters concealed in the flooring. Fresh air from outside is admitted by baffle plates, and the warmth is controlled by thermostats. Egg washing is done by an electrically operated "Summit" machine supplied by Messrs. Cope & Cope, Ltd. A "Bingham" machine is used for plucking cockerels not required on the farm.

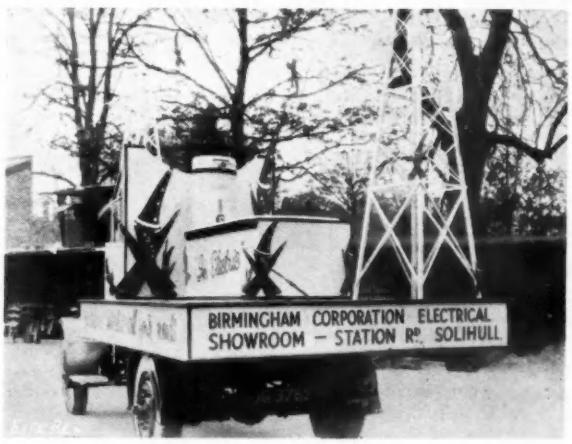
New Electricity Showrooms

On Saturday last the new showrooms of the Cheadle and Gatley U.D.C. Electricity Department at Cheadle Hulme were formally opened by Councillor E. Y. Sharples, chairman of the Electricity Committee. An electricity supply for Cheadle and Gatley was inaugurated in November, 1922, a bulk supply being taken from the Manchester Corporation Electricity Department. In the year 1924-25 the sales of electricity were 440,000 kWh, while the estimated sales for 1935-36 are 7,600,000 kWh. Hire-purchase and assisted-wiring schemes are in operation and an "all-in" tariff with a "unit" charge of ½d. is proving very popular. In 1930 part of the ground floor premises of the Electricity Department were appropriated for displaying electrical appliances, and in order to further stimulate progress, the new showrooms, together with a demonstration and lecture room, have now been erected. The new building consists of two floors with a frontage of 37 ft. The interior of the showroom on the ground floor is oak panelled, whilst the usual shop window bottom and back have been eliminated to permit of the whole showroom becoming the "shop window." The first floor is to be used for demonstration and lecture purposes and is capable of seating ninety people. The whole work, with the exception of the electrical side for which Mr. R. W. Willis, M.I.E.E., the electrical engineer to the Council, has been responsible, has been designed by Mr. H. A. Yearsley, of Manchester.

The new showrooms of the Cheadle and Gatley U.D.C. Electricity Department

A Carnival Lorry

In the accompanying picture we show a decorated lorry equipped by the Birmingham Corporation Electric Supply Department which took part in the annual carnival procession at Solihull on May 2nd. As will be seen, effective use was made of the E.D.A. "I'm Electric" figure.



Carnival lorry at Birmingham

Wages in the Cable-making Industry

The Joint Industrial Council for the Electrical Cable-making Industry announces that there will be no "cost-of-living" alteration in wages on the third pay-day in June.

Recent Contract

A contract for the electric lighting, power, heating and cooking installation at the new Seaburn Hotel, Sunderland, has been placed with Messrs. F. Reid Ferens & Co., Ltd.

Works Extensions

Extensions are in hand at the Park Royal works of B. E. N. Patents, Ltd. The present offices, which are situated on the ground floor, are being replaced by a modern two-storey building which, in addition to containing the administrative offices, will also include the drawing office, experimental department, showroom and demonstration room. New machinery is already being installed which will eventually more than double the capacity of the machine shop.

A Henley Cruise

Upon the day of Henley's annual meeting on Friday last (reported in our Financial Section), the Henletel Social and Athletic Club held its first summer fixture. The M.V. *New Dagenham* was chartered for an evening dance cruise from

Westminster to Gravesend, and a company of about 230, including forty members of the staff of Henley's Tyre & Rubber Co., spent an enjoyable four hours on the Thames. Westminster Pier was reached well before midnight, and there were many requests for a repeat cruise later in the season.

Ilford Service Vans

The Ilford Corporation Electricity Department has recently put into service a number of electric delivery vans, and in the accompanying illustrations we show two of the types in use. The one on the left is a Morrison electric vehicle which is utilised in connection with the delivery of cookers and other apparatus. It has a range of 60-70 miles with a speed of 25-28 m.p.h., and is finished in dark blue with gold lettering and gold beading. The other is an Electricar vehicle, on one side of which is a pictorial advertisement of electric cooking and on the other one drawing attention to water heating. The colours are pale and dark green.

Two electric vehicles recently put into service by the Ilford Corporation Electricity Department

Trade Announcements

Messrs. Rowlands Electrical Accessories, Ltd., have arranged a special series of displays of their products, and practically every important centre in the country will be covered during the next few months. The first two displays will be held in Glasgow at the Stockwell Stock Rooms, Stockwell Street, from May 25th to May 29th, and in Edinburgh at the Cockburn Hotel from June 1st to June 3rd. Other centres for which displays are being arranged include Newcastle-on-Tyne, Sheffield, Bristol, Cardiff, Manchester, Birmingham and London.

The British Aluminium Co., Ltd., has opened a branch office and warehouse at Rose Street, Temple, Bristol (telephone No. 21747), under the management of Mr. O. Halliwell. At this warehouse the company will hold stocks of its standard products.

Members of the Birmingham Electric Club at the Prescot Works of British Insulated Cables, Ltd.

The Westminster Tool & Electrical Equipment Co., Ltd., has recently issued a second folder on coils by "M.I.E.E." This describes the winding operations.

Kelly's Directory

The fiftieth edition of "Kelly's Directory of Merchants, Manufacturers and Shippers of the World" (Kelly's Directories, Ltd., 64s., post free), has now been published. It conforms to the general arrangement of preceding editions and consists of two volumes, the first containing information concerning all the countries of the world except the British Empire, with which the second volume deals. Volume 1 is divided by continents as follows:—Europe; Asia; Africa; America (Central, North and South), and the West Indies. The division for each continent contains in alphabetical order sections for the countries which form part of that continent. The section for each country contains in alphabetical order sub-sections for the towns in that country. The sub-section for each town is divided in its turn into trade headings arranged in alphabetical order, and under the trade headings are given in clear fashion the names and addresses. For the United States of America there is a general trade classification in which the names of those engaged in any trade throughout the country appear in one alphabetical list under the heading referring to their trade. The second volume, devoted to the British Empire, is divided as follows:—Great Britain and Ireland; the British Dominions, Colonies, Possessions, Protectorates and Territories under British Mandate in Europe; in Asia; in Africa; in America; in Australia, and in New Zealand. The section for Great Britain and Ireland is divided into three parts:—England, Scotland and Wales (except London); London; Ireland. Each part contains an alphabetical list of firms, a classification of the firms under the trade headings, a list of telegraphic addresses, and separate lists of the exporters and importers arranged alphabetically under the headings of goods in which they deal. There is a great deal of other useful information and a complete index in four languages.

Works Visit

A party of 109 members of the Birmingham Electric Club were the guests of British Insulated Cables, Ltd., on a visit to the Prescot Works. Luncheon was taken on the train from Birmingham to Liverpool, as guests of the company, and the party was met by charabancs at Lime Street Station. An interesting tour of the works was undertaken and the afternoon was devoted to viewing copper refining, wire drawing and the manufacture of welders, meters and electrical accessories. Afterwards the visitors were entertained to tea, Mr. Bolton and Mr. Millinger, on behalf of the directors of British Insulated Cables, Ltd., welcoming them, and Mr. Clark, president of the Club, thanked the company for its hospitality. On the way back to the station the party was driven through the Mersey Tunnel and returned by train to Birmingham.

Electrical Ironmongers

The annual conference of the Ironmongers' Federated Association was held at Folkestone last week. According to the *Ironmonger*, the annual report which was presented included a reference to the Electrical Section which now claimed to have a membership of 107. It was stated: "This has been a very important and strenuous year for the officials of the Section; much time has been spent upon organisation and in combating the very definite opposition put up by kindred associations in the trade. Negotiations have been continued with the Fair Trading Council regarding the application of the Electrical Section for the election of representatives to serve on this body. The Fair Trading Council intimated that the representatives of N.E.C.T.A. at present serving on the Committee were fully able to represent the retail electrical industry, and it was suggested that an affiliation should be arranged between N.E.C.T.A. and the Electrical Section of the I.F.A. Negotiations are still pending." The "Buyers' Guide" issued by the Section was stated to have been "well received" by members. An employment bureau has been started to bring assistants with electrical qualifications into touch with employers requiring employés. "The committee of the Section feels that there is urgent necessity for ironmongers' assistants to have technical electrical knowledge, and it is hoped eventually to establish a

register of qualified assistants. The great need at the moment is for every electrical ironmonger to join the Section."

Elexcel London Showroom

Elexcel, Ltd., the new company which now acts as distributor for "Xcel" domestic appliances, has just opened a new

The new London showroom of Elexcel, Ltd.

showroom at Melbourne House, Aldwych, London. Examples of fires, irons, hot-plates, &c., are displayed in separate limed-oak cubicles, each of which is equipped with its own switch-socket. The attractive range of inset fires now available comprises models let into a central circular display counter, the glass top of which is illuminated from beneath. Glass-fronted cabinets along one side of the showroom contain small items such as kettles, toasters, tubular heaters and towel rails, while space is also provided for specimens of electric cookers.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances :—

CHEMICALS, ETC.	Price. May 20th.	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£36	—
a Ammonia, Muriate (large crystal) ... „	£18 10s.	—
a Borax ... ... „	£17	—
a Copper, Sulphate ... ... „	£15 10s.	—
a Potash, Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a „ Perchlorate ... ... „	6d.	—
a Shellac ... ... per cwt.	£4 18s.	—
a Sulphur Commercial ... ... per ton	£11	—
a „ Roll ... ... „	£11	—
a Soda Chlorate ... ... per lb.	3¾d. to 3¾d.	—
a „ Crystals... ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d. nett.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b „ Wire ... ... per lb.	1/1 to 1/9	—
b „ Sheet and Foil ... ... „	1/3 to 2/9	—
p Babbitts Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£188	£4 dec.
Grade II ... ... „	£130	£2 dec.
Grade III ... ... „	£69	—
c Brass (rolled metal 2" to 12" basis) ... per lb.	7½d.	—
c „ Tubes (solid drawn) ... ... „	9½d. to 10d.	—
c „ Wire, basis ... ... „	7¼d.	—
c Copper Tubes (solid-drawn) ... „	10½d.	½d. inc.
g „ Bars (best selected) ... per ton	£70	—
g „ Sheet ... ... „		
g „ Rod ... ... „		
d „ (Electrolytic) Bars ... ... „	£41 15s.	—
d „ „ Wire Rods ... „	£47 15s.	—
d „ „ H.C. Wire ... per lb.	7¾d.	—
f Ebonite Rod ... ... „	1/6 to 2/- plus	—
f „ Sheet ... ... „	1/3 to 1/6 10%	—
n German Silver Wire ... ... „	2/5	—
h Gutta-percha, fine ... ... „	nom.	—
h India-rubber, Para-fine ... ... „	9d.	—
i Iron, Pig (Cleveland No. 3) ... per ton	67/6	—
i „ Wire galv. No. 1, P.O. Qual.... „	£20	—
g Lead, English Pig ... ... „	£17 10s.	10s. dec.
g Mercury ... ... per bot.	£11/17/6 to £12/7/6	—
e Mica (in original cases) small ... per lb.	9d. to 1/6	—
e „ „ „ medium ... „	5/- to 10/-	—
e „ „ „ large ... „	10/6 to 17/6 up	—
p Phosphor Bronze, plain castings ... „	1/1	—
p „ „ drawn bars & rods „	11¾d.	—
p „ „ rolled strip & sheet „	11¾d.	—
p „ „ wire ... ... „	1/0½	—
o Platinum ... ... per oz.	£7	—
d Silicium Bronze Wire ... ... per lb.	8½d.	—
g Spelter ... ... per ton	£14 10s.	7/6 dec.
r Steel, Magnet, in bars ... ... per lb.	7¾d.	—
g Tin, Block (English) ... ... per ton	£200	£5 10s. dec.
n „ Wire, Nos. 1 to 16 ... ... per lb.	3/8	—

Quotations supplied by :—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. F. Dennis & Co.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in our "Business Notes" under the same heading.

Association of "Old Cromptonians"

As a result of the large demand for tickets for the annual dinner of the Association of "Old Cromptonians" this evening (Friday) the venue of the dinner has been changed from the Hotel Victoria to the Mayfair Hotel, Piccadilly, W., to provide greater accommodation.

New Turbo-Alternators for Hams Hall

In connection with the extensions to Hams Hall power station, Birmingham, two Parsons-G.E.C. 62,500-kVA turbo-alternators, together with control gear, are being installed, and a third set of similar capacity has been ordered. These extensions represent part of Birmingham Corporation's £2,000,000 scheme. Each turbo-alternator comprises a Parsons turbine coupled to a G.E.C. alternator. The turbines consist of two cylinders in tandem and run at a speed of 1,500 r.p.m. They are supplied with steam at a pressure of 350 lb. per sq. in. gauge at the stop valve, and a temperature of 730 deg. F. Reaction blading is used throughout, the high-pressure cylinder having forty pairs of rows of guide and moving blades, while the low-pressure cylinder has a further thirty rows of blades. Provision is made for heating the feed water to 306 deg. F. by extracting steam from the turbine at three different pressure stages. The alternator is rated at 62,500 kVA, 11,000 V, 3-phase, 50-cycles, and is of standard G.E.C. design, having a fabricated stator and a rotor forged from solid steel. The transport of these machines to site is of interest in view of their size and weight. Each set, complete with Worthington-Simpson condenser, weighs approximately 600 tons. The turbine stator was brought from Parsons works at Newcastle by rail, while the alternator stator and rotor weighing 150 tons were taken separately by road direct from the G.E.C. works at Witton on a special truck hauled by two traction engines. The distance from Witton Works to Hams Hall is about nine miles and the speed of transport one m.p.h. The journey was

A 150-ton load for Hams Hall, Birmingham

undertaken early in the morning of Sunday last. Our picture shows the alternator stator and rotor leaving the Witton Works.

New Catalogues and Lists

Eca-Ray Sales, Ltd., 3 and 7, Sandland Street, High Holborn, London, W.C.1.—The company's general catalogue has been enlarged from sixteen to forty-eight pages, and contains details of many new lighting fittings and reflectors.

S. Wolf & Co., Ltd., Pioneer Works, Hanger Lane, Ealing, W.5.—A second issue of the "Electric Tool User."

Ferguson, Pailin, Ltd., Higher Openshaw, Manchester, 11.—Catalogue sections dealing with circuit-breakers and switchgear.

W. Canning & Co., Ltd., 133, Great Hampton Street, Birmingham, 18.—Electro-plating is dealt with in a new booklet which shows various classes of goods being electro-plated with different metals.

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.—An illustrated booklet describing Fraser & Chalmers mining and metallurgical equipment for all classes of mining, milling, metallurgical and ore-handling machinery.

Alliance Wholesale, Ltd., 62, Great Russell Street, London, W.C.1.—A catalogue of electric vacuum cleaners and floor polishers.

Marelli & Co., Ltd., Artillery House, Artillery Row, Victoria Street, London, S.W.1.—A catalogue of electric fans.

Cooper-Stewart Engineering Co., Ltd., 136, Long Acre, London, W.C.2.—Leaflets on the "Dustmaster" and "Stewart" vacuum cleaners.

Samuel Osborne & Co., Ltd., Clyde Steel Works, Sheffield.—A catalogue describing "Evershyne" and "Weldshyne" stainless steels.

Bankruptcy Proceedings

J. W. P. Swale, 28, Dalton Green Lane, Huddersfield, lately carrying on business at 59, Wakefield Road, Moldgreen, Huddersfield, radio and electrical engineer and dealer.—At the first meeting of creditors held in this matter recently at the Official Receiver's Office, Hallfield Chambers, 71, Manningham Lane, Bradford, it was stated that the gross liabilities were £1,414, and there was a deficiency of £392. Debtor attributed his failure to accepting responsibility for defaulting debtors' accounts

under hire-purchase agreements, bad debts, and a certain measure of incompetence in control of accounts. The matter was left in the hands of the Official Receiver.

J. S. Plumbe, lately carrying on business in co-partnership with another at Liverpool Road South, Maghull, Lancs, and also lately carrying on business at Guildhall Road, Walton, Liverpool, electrical contractor.—The public examination in this matter was held recently at Liverpool. Debtor had prepared a statement of affairs showing ranking liabilities of £511 with net assets of £51, and a deficiency of £460. He said that he commenced trading in partnership with another in 1923, the joint capital being £20. The work consisted of installing electrical apparatus in houses erected by speculative builders. Debtor said that a complete record of transactions had not been kept. The partnership was dissolved in February, 1936, and debtor became liable for the partnership debts. The examination was concluded.

V. J. Donnison, trading as the Electrical Service & Repair Co., 56, King Street, South Shields, electrical dealer.—The public examination was held on May 14th at the County Court, Sunderland, when it was stated that the deficiency amounted to £1,007. The debtor stated that he and another commenced business as electrical dealers at South Shields in 1932, but after two months his partner left the business and since then he had traded alone. Several contracts were entered into for electrical work in houses and a loss was sustained on a contract for work in 119 houses. The debtor attributed his failure to losses on contracts and loss on a shop at Newcastle. The examination was adjourned.

G. M. Wilshaw, 18, Arkwright Street, Burnley, and **G. Sharpe,** 320, Padiham Road, Burnley, lately carrying on business in partnership as Wilshaw & Sharpe, 320, Padiham Road, Burnley, electrical dealers (separate application of G. M. Wilshaw).—The application for discharge of G. M. Wilshaw was heard on May 14th at the County Court House, Burnley. The receiving order was made in 1928 and the creditors had received dividends of 2s. 6½d. in the £. Experiments with a patent for wireless eliminators, which involved a loss of approximately £200, was given as one of the causes of the failure. The discharge was granted, subject to three months' suspension.

J. W. Hackett, 11, Paxton Terrace, Barrow-in-Furness, radio and electrical engineer.—This debtor attended at the Magistrates' Court, Barrow-in-Furness, on May 15th. It was stated that the gross liabilities amounted to £550 and the assets were estimated at £192. In reply to the Official Receiver debtor said he had traded at 11, Paxton Terrace since 1929. The business consisted mainly of selling and repairing radio apparatus and installing electric light. His commencing capital was £80, and he had stock worth about £30. The business was successful until 1934. He had kept certain books of account which had been destroyed in a fire last year. He agreed that his failure was due mainly to inadequate control over the business. The examination was closed.

A. Ambrose, 137, Market Street, Chorley, Lancs, formerly 39, Steeley Lane, Chorley, electrical engineer.—This debtor attended at Preston on May 15th for his public examination. His statement of affairs showed gross liabilities of £733 and a deficiency of £354. Debtor attributed his failure to losses in wireless stock from 1930 to 1934, payment of customers' accounts under guarantees to finance companies who took over the accounts, and heavy law costs on writs and summonses. The examination was adjourned for closing.

C. W. Coombes, electrical engineer, "Verdley," Portsmouth Road, Milford.—First meeting May 22nd at 29, Russell Square, W.C. Public examination June 23rd at the Guildhall, Guildford.

A. E. Poole and **H. Marsters** (Poole's), electrical engineers, 33, Union Street, Wednesbury.—Last day for receiving proofs for dividend May 29th. Trustee, Mr. F. E. Bendall, 3, Warwick Passage, Corporation Street, Birmingham.

F. G. Harrison, wireless and electrical conractor, Ramper Charging Station, Saundby, Notts.—Last day for receiving proofs for dividend May 30th. Trustee, Mr. E. C. Midgley, 1, St. Swithin's Square, Lincoln, Official Receiver.

A. Roberts, electrical and radio engineer, 73, Church Street, Gainsborough.—Last day for receiving proofs for dividend May 30th. Trustee, Mr. E. C. Midgley, 1, St. Swithin's Square, Lincoln, Official Receiver.

J. Mellanby, electrical engineer, Mystery House, Cambridge Road, Waterbeach.—Application for discharge to be heard on June 18th at the Guildhall, Cambridge.

Midland Electrical Installations, electrical engineers, 443, Meadow Lane, Nottingham.—Receiving order made May 6th on a creditor's petition.

C. I. Hughes, electrical engineer, County Road, Ormskirk.—First meeting May 22nd at the Official Receiver's offices, Government Buildings, Victoria Street, Liverpool. Public examination June 30th at the Court House, Liverpool.

M. Chesler, wireless and electrical dealer, 186, St. Paul's Road, Balsall Heath, Birmingham.—Application for discharge to be heard on June 16th at the Court House, Birmingham.

Company Liquidations

Electrical Equipment & Carbon Co., Ltd., 109, New Oxford Street, London, W.C.—A meeting of this company's creditors was held at the Holborn Restaurant, London, W.C., on May 18th, when Mr. C. Leven, a director, who presided, said that the shareholders had passed a resolution nominating Mr. J. E. Ward as liquidator. A statement of affairs submitted disclosed liabilities of £22,288, all due to unsecured creditors, and net assets of £15,548, leaving a deficiency of £6,740. On the assets side there was also shown an item in respect of 1,000 ordinary shares of £1 each, fully paid in a company known as the Nevelin Electric Co., Ltd., but as this company had only been formed a few weeks no value had been placed on it for the purpose of the statement of affairs. The Nevelin Co. had taken over certain agencies which were previously carried out by the Electrical Equipment & Carbon Co., and several creditors said that the matter would have to be gone into very thoroughly by the liquidator, as they considered there was a possibility of quite a substantial asset arising from this source at a later stage. Mr. Ward said that the issued and allotted capital of the Electrical Equipment & Carbon Co. was £6,000; the total deficiency as regarded contributories was therefore £12,740. The gross profit on trading from July 1st, 1935, to May 7th, 1936, was £7,928, and reserve funds at June 30th, 1935, amounted to £806. The total deficiency to be accounted for was £21,474. Mr. Leven said he attributed the present state of affairs directly to the fact that in the Budget of 1934 a tax was imposed under the Key Industries Duties on the importation of arc lamp carbons. This, he said, was the most important part of their business, and a very profitable one. In fact, they were the largest importers of cinema carbons in this country. In the 1934 Budget the duty on carbons was increased about 600 per cent., which made importation prohibitive, and the result was nothing short of a complete embargo. The directors fought these duties by representation to the Board of Trade, and even carried their case to the House of Commons in the debate on the Finance Bill, but they were unsuccessful in obtaining any relief. Every effort was made to build up new lines. They had previously started a rectifier business which was a highly technical one, and the development of this side of the business alone cost about £8,000. They were also negotiating with friends in Vienna to start a bulb factory in this country. They also went into the radio business, and to be competitive they had to buy about one hundred sets at a time. This side of the business proved a complete failure. The chairman added that when the business was really successful, with their largest creditor alone they were doing a turnover of something like £600,000 a year. He then came to another item—the amount owing by himself of some £7,000. He said that before the Budget of 1934 was introduced, they were doing exceedingly good business and provided the orders which they then had on hand could have been executed there would have been nothing to have stopped him paying back every penny he had borrowed from the company. A resolution was passed appointing Mr. C. C. Lyon, of Messrs. Edward Blinkhorn Lyon & Co., Leadenhall Street, E.C., and Mr. Maples, of Messrs. Spain Bros., London Wall, E.C., as joint liquidators of the company. A committee of inspection was also appointed consisting of five of the largest creditors to act with the liquidators. The following are creditors:—Blackheath Stamping Co., £310; British Electric Transformer Co., Ltd., £590; Dewhurst & Partner, Ltd., £1,368; Elin A. G. (Vienna), £4,308; Foster Engineering Co., Ltd., £1,224; Hampton & Dean, £319; Mersey Cable Works, Ltd., £113; McMillan & Co., Ltd., £245; K. Pfisterer (Stuttgart), £299; Siemens-Planiawerke A.G. (Berlin), £7,289; Simpson Bros. (Hapton), Ltd., £210; J. G. Statter & Co., £322; Strong Electric Corpn., £297; Suddeutsche Kabelwerke A.G. (Germany), £426; L. J. Hitchcock, £1,207; Commissioners of Inland Revenue, £369; and Bankers, £2,773. There are also a number of creditors for amounts under £100.

British Crystal Lamp Co., Ltd.—Mr. R. A. Harting, 2, Coleman Street, London, E.C.2, was appointed liquidator of this company on April 21st. A statement of affairs as at January 6th last, submitted by directors of the company, shows that the company had an issued capital of £200. The total liabilities are given as £16,399 (£12,571 unsecured) and after meeting the claims of the debenture holders and preferential creditors there is no balance to meet the unsecured creditors' claims. The company was incorporated in 1933 as the British Crystalite Co., Ltd., to carry on business as wholesale dealers in electric lamps. The initial capital was £100 in ordinary shares and later £100 in preference shares was issued. The company's name was altered as the result of an action by another company whose name it closely resembled. During 1934 debentures for £5,000 were issued in respect of a loan and a second debenture for £5,000 (shown as collateral security for the first loan) was also created. In January last a receiver was appointed by the first debenture holders but upon the making of the winding-up order the Official Receiver pointed out that the directors' borrowing powers were limited to the amount of the share capital which was £100 at the date of the debentures. The latter were therefore invalid except to the extent of £100. The receiver accordingly withdrew and the business was closed down. In 1935 the company was involved in litigation the outcome of which was a petition by the other party for the winding-up of the company and an order was made on February 24th; this was stayed for fourteen days with a view to an arrangement but was made effective on March 9th. The company's failure is variously attributed by the directors (Messrs. Epstein, Duke-Cohan, Cornwell and Ismay) to bad debts (due to the sale of faulty lamps), the selection of unsuitable distributors, the giving of excessive credits and shortage of working capital. It appears to be the general opinion of the directors that the company could have carried on successfully but for the action of the petitioner.

Frank Deeling, Ltd., electrical engineers, 913, Brighton Road, Purley, Surrey.—The statutory meeting of creditors was held recently when a statement of affairs was submitted which showed ranking liabilities of £1,949 and net assets of £416, with a deficiency, so far as the creditors were concerned, of £1,533. The company was formed in June, 1932, taking over an existing business. The purchase price was satisfied by the issue of fully paid shares of £736 and a cash payment of £255 2s. Subsequently further shares were allotted for cash. The business had never been a success and consistent losses had been sustained. The shareholders had previously met and passed a resolution putting the company into voluntary liquidation, and nominated Mr. Daintree, 9, King's Bench Walk, London, W.C., as liquidator. A creditor inquired whether there was any offer before the meeting, but it was stated that the directors had no proposition to submit. It was also asked whether cash claims for £527 would be withdrawn if the creditors agreed to the continuation of the voluntary liquidation. The cash creditors concerned were not present at the meeting, and it was resolved that the meeting should be adjourned for a week to enable the cash creditors to consider whether they would withdraw their claims.

Leeds Radio Services, Ltd.—Particulars of claims by May 30th to the liquidator, Mr. J. Beardsworth, 28, East Parade, Leeds.

Mavox Radio, Ltd.—Particulars of claims by May 30th to the liquidator, Mr. L. W. Glyde, 17, Basinghall Street, E.C.2. Final meetings of creditors and shareholders will be held on June 25th.

Electricity Supply

Lighting, Domestic, Power

Ammanford.—UNDERTAKING NOT TO BE SOLD.—The Urban District Council has refused to consider the sale of its undertaking to the Llanelly and District Electric Supply Co., Ltd. The Council receives its supply in bulk from the company.

Bedford.—INCREASED POWER TARIFF.—The borough electrical engineer has denied statements to the effect that electricity charges to domestic consumers in Bedford are to be increased. The only proposed increase, he states, is in the charges to power consumers, due to the increased cost of coal, of which the Department will meet about half.

Birkenhead.—OVERHEAD LINES.—The Electricity Committee is to extend its overhead lines in the Great Sutton district at a cost of £950.

Bradford.—MAINS EXTENSIONS.—An expenditure of £20,000 for mains extensions has been sanctioned by the Electricity Committee.

Campbeltown.—CHANGE FROM GAS TO ELECTRICITY.—Despite opposition by the Gas Committee the Town Council has decided to have the streets lighted by electricity. Hitherto, for seventy-five years, gas lighting has been employed. The Campbeltown and Mid-Argyll Electric Supply Co., Ltd., informs us that it has received from the Council a seven-year contract for lighting the streets of the town.

Cardiff.—LOWER CHARGES.—The price of energy for charging electric vehicles and for bakers' ovens has been reduced to ½d. per kWh during off-peak hours.

Carlisle.—EXTENSIONS.—The Electricity Committee is to extend mains in Castletown Brampton and Cumwhinton at a cost of £1,414.

Chesterfield.—MAINS AND SERVICES.—Sanction to a loan of £21,000 for mains and services is being sought by the Electricity Committee.

Clitheroe.—ELECTRICALLY EQUIPPED COLLIERY.—The extensive Bankfield Quarries have been taken over by Messrs. Hillhead Hughes, Ltd. New plant is being installed which will be electrically driven and heated, the supply being taken from the Corporation.

Colchester.—LOWER CHARGES.—The Electricity Supply Department has announced reductions in charges, including the following domestic rate: "Unit" charge of ¾d. reduced to ½d. for all consumption in excess of 500 kWh per quarter; new minimum assessment of 10s. per quarter. Special water-heating rate: Quarterly rental of 3s. 6d. for time switch cancelled. Cooker and water heater hire charges: A further reduction of 1s. per quarter after four years. Lighting rate (large consumptions): Applicable now to consumers with 3,000 W of lighting installed. Distribution charge for premises outside the borough of Colchester reduced from 15 to 10 per cent. Lighting flat rate (outside borough), 7d. per kWh. New tariff for charging electric battery vehicles only: ½d. per kWh (urban areas); ¾d. (rural). An improved maintenance service is also to be introduced.

Congleton.—AMENDED CHARGES.—We are informed by Mr. R. Bell, borough electrical engineer, that amended charges for electricity have been adopted, operating as from April 1st last. The new lighting flat rate is 6d. per kWh (reduction of ½d. per kWh for both quarterly and slot meter supplies). Alternatively, there is a multi-part tariff with a fixed charge based on floor area and a running charge of ¾d. per kWh; this replaces the two-part rateable value tariff and sliding scale. For business premises the flat rate is reduced by ½d. to 5½d. per kWh, and an alternative multi-part tariff replaces the "computed area" tariff. Late shop-window lighting is reduced by 1d. to 2d. per kWh, and outside sign lighting by ½d. to 3d. per kWh. For cinemas there is an all-in tariff of 3d. per kWh for the first 10,000 (formerly 15,000) kWh per annum, and 2½d. per kWh for all further supplies. Factory lighting is reduced by ½d. to 3d. per kWh and public lighting by 1d. to 2d. per kWh.

Doncaster.—NEW EQUIPMENT.—A recommendation for the provision of additional h.v. feeders and extra sub-stations estimated to cost £13,740 has been approved.

Dumfries.—LOANS FOR EQUIPMENT.—Application is to be made by the Electricity Committee for sanction to borrow £7,825 for cable works and sub-station equipment.

Dunfermline.—ELECTRICITY TO REPLACE GAS.—The Town Council has agreed to the substitution of electric lighting for gas in 427 municipal houses at a cost of nearly £3,000.

Eastbourne.—OVERHEAD LINES.—Sanction has been received from the Minister of Transport to the erection of overhead lines at Otham Court, Polegate, Hawkstown sewage pumping station and Hawthylands Lane.

EXTENSIONS.—The Electricity Commissioners have sanctioned loans for extensions to Hydneye estate, Hampden Park (£3,205); Friday Street and Langney (£1,894); Ersham Lodge estate (£3,554); Polegate Stud Farm estate (£307); and £25,000 for unspecified mains and services.

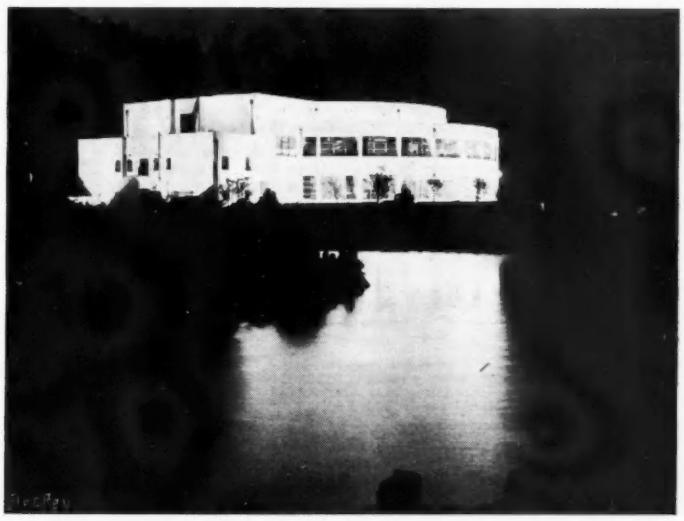
Eccles.—LOWER CHARGE.—The cost of electricity taken through prepayment meters is to be reduced from 5d. to 4½d. per kWh.

ELECTRIC-DISCHARGE LIGHTING.—Electric-discharge lighting is to be provided in Regent Street, Church Street and Gilda Road, at a cost of £1,642.

Finchingfield (Essex).—CABLE TO BE LAID UNDERGROUND.—*The Times* reports that Finchingfield, said to be one of the three finest villages in England, is to have an electricity supply, but that the beauty of the village is to be preserved by laying the mains underground in the central area. The East Anglian Electric Supply Co., Ltd., has consented to do this in consideration of the payment of £100 towards the increased expenditure.

Forden.—CANVASS.—The North Wales Power Co. has informed the Rural District Council that the whole district is to be canvassed to ascertain the demand for electricity. The Montgomeryshire County Council is being approached with a view to having a supply for the Public Assistance institution at Forden.

Haslingden.—REVISED CHARGES.—A copy of the reduced electricity charges has been sent to us by Mr. W. T. Hilder, the borough electrical engineer. Lighting is now charged for at from 4½d. to 3d. per kWh, according to the amount consumed, instead of from 5d. to 3½d. as hitherto. Electricity supplied for shop window lighting and advertising signs is reduced from 1½d. to 1d. per kWh. For heating and cooking all electricity above 260 kWh per quarter is to be charged at 0.6d. per kWh instead of ¾d., while the rateable value running charge for consumptions above 160 kWh per quarter is reduced to ½d. per kWh. The "block" tariff for small power supplies is also reduced throughout.



The floodlighted Floral Hall at Hazelwood, Belfast, seen from across the lake

Hastings.—NEW EQUIPMENT.—Application has been made for consent to purchase cookers, water heaters, &c. (£6,000) and meters (£7,000). H.v. mains extensions are to be carried out at an estimated cost of £10,470.

Hungerford.—RURAL SCHEME.—The Wessex Electricity Co. has informed the Rural District Council of its intention to link up the whole of the villages from Stockcross to Lambourn with its supply network.

Keighley.—NEW "ALL-IN" TARIFF.—A domestic "all-in" prepayment meter rate of 1d. per kWh has been introduced by the Electricity Committee. This charge includes the cost of electricity, standing charge, meter rent and cooker hire charge (with wiring).

Llanfairfechan.—REDUCED LIGHTING FLAT RATE.—The lighting flat rate has been reduced by the Council from 8d. to 7d. per kWh, as from April 1st last.

Lichfield.—RURAL SUPPLIES.—The City Council has requested the city electrical engineer to prepare a comprehensive scheme for supplying farms and rural areas, and the Rural District Council is to be asked if it will act as guarantor in connection with such a scheme.

WATER HEATING TARIFF.—A charge of ½d. per kWh is to be made for time-switch-controlled off-peak load water heating supplies.

London.—BATTERSEA.—The Borough Council is to re-wire and improve the lighting at the town hall and municipal buildings at a cost of £1,160.

GREENWICH.—Electricity is to be provided in 490 houses on the Charlton estate, at a cost of £4,410.

Macclesfield.—SUPPLY EXTENSION.—The Electricity Company of Macclesfield, Ltd., is to commence at an early date a scheme for giving a supply to Pott Shrigley, in the area of the Rural District Council.

Motherwell.—LOANS FOR APPARATUS.—A recommendation has been passed by the Electricity Committee for the borrowing of £10,000 for meters. It is also recommended that a further £10,000 shall be borrowed for the provision of apparatus under the hire-purchase scheme.

Ross-shire.—SUPPLY EXTENSION.—The Ross-shire Electric Supply Co. has applied to the Board of Trade for consent to the erection of an overhead h.v. line across the entrance channel of Loch Fleet. The company proposes to extend its system from Dornoch to Golspie.

Russia.—ELECTRICITY GENERATED BY WIND POWER.—A large wind-power station is now being constructed on the highest mountain peak of the Crimea. When finished it will have a capacity of 10,000 kW and will be the biggest station of its kind in the Soviet Union, states a *Reuter* message from Moscow. The two sails will be mounted on a 532ft. tower of reinforced concrete. The use of wind as a source of electric power is to be widely developed in Russia, where water power is scanty over large areas. The station now being erected will begin operation in 1938 and will constitute part of the h.v. network in the Crimea.

CENTRAL HEATING.—A report in the *Bulletin* of the Russo-British Chamber of Commerce states that the first central-heating mains in Moscow have completed their fifth year of operation, and that they now rank second only to the system in New York in the volume of heat supplied. In 1935 the system delivered 900,000 million calories of heat. The heating capacity of Moscow's heat and power stations is 89,000 kW, and the length of its central heating network is equivalent to 40 km. At present central heat is supplied to thirteen of the largest plants, seventy-five enterprises and institutions and twenty-six large apartment houses. After the reconstruction of Moscow, the capacity of the stations will be increased eight or nine times.

NEW HYDRO-ELECTRIC STATIONS.—In the same publication it is stated that twenty-three new hydro-electric stations will be constructed in White Russia this year to serve sixty-three collective and two State farms. Construction of four power stations to serve collective farms is also well under way, and thirteen generators have been received from the Kharkov and Ural machine building plants, while orders for eight turbines and other equipment have been placed with the Stalin plant in Bobruisk.

Scarborough.—PROPOSED EXTENSION OF SUPPLY AREA.—A proposal is being considered by the Town Council to extend its area of supply to include Staxton, Ganton and Sherburn, which are at present in the area of the Buckrose Light and Power Co., Ltd.

ELECTRICITY FOR HOUSING ESTATES.—Estimates have been prepared for a supply of electricity to the Filey housing estates.

MAINS AND SERVICES.—Application is to be made by the Town Council for sanction to borrow £40,000 in respect of new mains and services.

Shipley.—NO CHARGE FOR SERVICE CABLE.—Where houses are wired for cookers no charge is to be made by the Electricity Committee for laying the service cable.

Stalybridge and District.—ELECTRICITY IN SCHOOLS.—The Stalybridge, Hyde, Mossley and Dukinfield Joint Tramways and Electricity Board has offered to equip certain schools with electrical appliances. Schools where domestic science and cookery lessons are given may obtain the use of cookers, washing machines and other electrical appliances free of charge, subject to the authority concerned paying for all electricity consumed by such apparatus at the rate of ½d. per kWh.

Stoke-on-Trent.—ELECTRIC KILNS.—A detailed report compiled by the electrical engineer (Mr. C. H. Yeaman) on the question of the supply of electricity for experimental work in connection with electric kilns for glost firing in the pottery industry is to be considered by the Electricity Committee at its meeting this month.

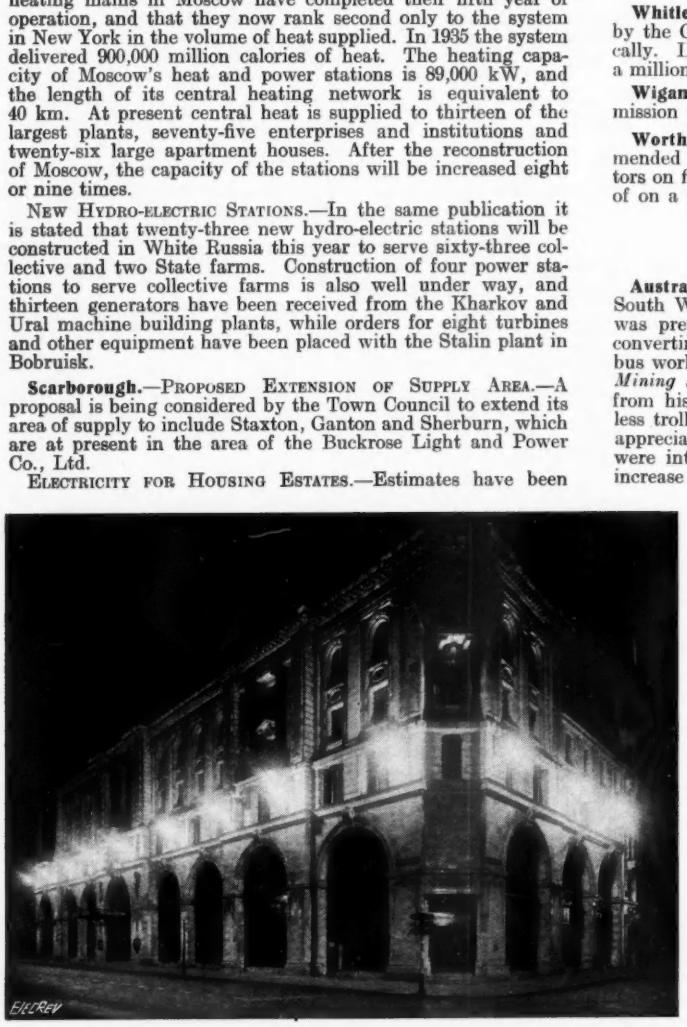
Swansea.—REFRIGERATORS.—Application has been made by the Town Council for a loan of £5,000 for the purchase of refrigerators to be let out on hire-purchase terms.

Tiverton.—BULK SUPPLY ARRANGEMENT.—In January last the manager of the electricity undertaking reported that it would be necessary to increase the generating plant or obtain a bulk supply before October. The Electricity Commissioners would not sanction the provision of further generating plant if a bulk supply could be obtained at no additional cost, so the Electricity Committee negotiated terms with the Whitehall Securities Corporation, Ltd. At its recent meeting the Council decided to accept the company's final offer (£4 10s. per kW of maximum demand and 0.4d. per kWh.; no guarantee of annual m.d., which is to be measured in the four winter months only. Council's generating station to be closed by January 1st, 1939). Application is being made for sanction to a loan of £16,000 for the necessary work.

Whitley Bay.—ILLUMINATIONS.—About £1,500 is to be spent by the Council this year on illuminating the sea front electrically. Last year the cost was £1,000, and it is estimated about a million people came to Whitley Bay to see the illuminations.

Wigan.—NEW MAINS.—Application is to be made for permission to borrow £30,000 for mains.

Worthing.—REFRIGERATORS.—A scheme has been recommended by the Electricity Committee for the sale of refrigerators on five-year hire-purchase terms at 2s. 6d. a week, instead of on a four-year basis.



The accompanying photograph gives a good idea of the excellent effect obtained by the new exterior lighting of the premises of Messrs. Debenham & Freebody. Siemen's "Sieray Dual" lamps are used in place of gasfilled lamps of the same wattage

Traction

Australia.—CONVERSION OF TRANSPORT SERVICE.—The New South Wales Transport Commissioner recently stated that he was prepared to make an immediate start on the work of converting the Kogarah-Sans-Souci steam tram route to trolley-bus working. He is reported in the *Industrial Australian and Mining Standard* to have said that he was perfectly satisfied from his experience overseas that the introduction of a rail-less trolley system to serve the route would meet with public appreciation. It had been found that where trolley-buses were introduced there had almost invariably been a marked increase in traffic.

Brighton.—TROLLEY-BUS BILL REJECTED.—The Town Council's Bill for the introduction of trolley-buses was rejected by a House of Lords Select Committee last week. This was the third effort by the Corporation in recent years to secure a reform of local passenger traffic conditions.

Dresden.—NEW TRAMCARS.—To celebrate the opening of the Reich Garden Show at Dresden, eight new tramcars of the latest type, capable of travelling at a speed of 60 km.p.h. (37½ m.p.h.), will be put into service, learns *Reuter's Trade Service* from Berlin. By means of a lever the back-rests can all be changed around to face the reverse direction. Hot-water heating is installed along the sides of the cars, and three independent brakes are provided.

L.N.E. Railway.—NEW SIGNALLING SYSTEM.—Colour-light signals are to be introduced on the main Eastern Counties line between Shenfield and Chelmsford.

Merthyr Tydfil.—TOO COSTLY.—Since the acquisition of the Merthyr Electric Traction & Lighting Co.'s light railway by the Corporation would involve the latter in an expenditure of £35,000, it has been decided not to proceed with the matter.

Russia.—MOSCOW SUBURBAN TRAINS.—A number of stream-lined 1,500 V d.c. electric trains are being built at the Mitischi car works for operating fast suburban services from Moscow to Sofrino and Sagorsk. They are to have a maximum speed of 87 m.p.h., compared with the 68 m.p.h. of the present three-car trains.

Switzerland.—RACK RAILWAY CONVERSION.—A start has been made on the electrification of the Pilatus rack railway, near Lucerne, and it is expected that a d.c. electric service will be inaugurated in the summer of 1937.

United States.—NEW YORK RAILWAYS.—Since the end of December last 400 passenger cars have been delivered to the New York Board of Transportation for service on its forty-two route miles of subway. These cars form part of a $19,000,000 order for 500 vehicles and twenty spare trucks which was placed with manufacturers by the Board about twelve months ago.

Communications

Germany. — TELEVISION-TELEPHONE. — Dr. Ohnesorge, the State Secretary at the Ministry of Posts, has announced a further extension of the television-telephone cable from Berlin to Hamburg and from Leipzig to Munich. The total length will be 620 miles.

Great Britain.—MORE RADIO LICENCES.—During April 474,539 radio licences were issued, representing a net increase of 25,846 and making the total in force 7,643,643.

STORM DAMAGE.—Mr. J. Stratton, A.M.I.E.E., writing in the *Post Office Electrical Engineers' Journal*, states that the past winter will be remembered by telephone engineers as one of the worst on record. Although the very wet weather gave trouble on the underground system by reason of floods and land subsidences, the worst damage was caused to the overhead lines by gales of wind and snow. Eighty-two per cent. of the trunk circuit wire mileage and 92 per cent. of the subscribers' circuit wire mileage are underground, yet from August up to the end of February there were 10,000 trunk lines and junctions out of order; 100,000 subscribers' circuits were interrupted; and 1,100 exchanges were isolated. During the wind and rain storm in October severe damage was caused in south-east Scotland, mostly by trees crashing. In the West Highlands communication between Glasgow and some fifty exchanges was severed. In January there was a general breakdown in Northern Ireland during a fierce snowstorm. When the wind dropped it was found that snow had accumulated to a diameter of 2 in. on the 100 lb. copper wires and 6 in. on some of the electric power transmission lines.

Russia.—AUTOMATIC TELEPHONE EXCHANGES.—The opening of six new automatic exchanges in Moscow this year, serving 40,000 subscribers, will greatly improve the city's telephone system, states the *Bulletin* of the Russo-British Chamber of Commerce. At present there are 107,000 telephones, of which 60 per cent. are on automatic exchanges. The new exchanges will take over 25,000 lines from the existing manual ones. For the construction of rural automatic exchanges 1.5 million roubles is being invested this year, and two million roubles will be allocated for the same purpose next year. The Commissariat for Communications will allot 2.2 million roubles in 1937 for the conversion into automatic systems of existing rural telephone communications in Leningrad and Moscow provinces. Several automatic exchanges for collective farms will be constructed this year; two different types are being installed, and their comparative efficiency for rural use will be closely checked.

NEW TELEGRAPH LINE.—Steel wires stretching from Alma-Ata, capital of the Kazakh Autonomous Socialist Republic, northward to Chelyabinsk, in Western Siberia, will soon bring these two cities into direct telegraphic communication, and will mark the completion of the third telephone and telegraph line across the vast territory of Kazakhstan, equal in area to almost a third of Europe.

Improvements on the Southern Railway

PART of a £500,000 scheme of improvements on the Southern Railway between Waterloo and Hampton Court was put into service last Sunday. The lines between Waterloo and Wimbledon have been entirely remodelled to avoid the necessity for local trains to cross over the "through" line, so causing delays. This has been accomplished by the construction of a "fly-over" bridge which takes the "up" local line over the through line. It is 2,200 ft. long, with a gradient of 1 in 60 rising and 1 in 45 descending.

In addition to the transposition of tracks and the building of the "fly-over" crossing an important feature of the new scheme is the installation of colour-light signalling between Waterloo and Hampton Court. Concurrently, this system of signalling, which is in use on the other suburban lines and on the Brighton main line, was brought into operation between Vauxhall and Malden, while the remainder of the scheme is to be introduced at a later date.

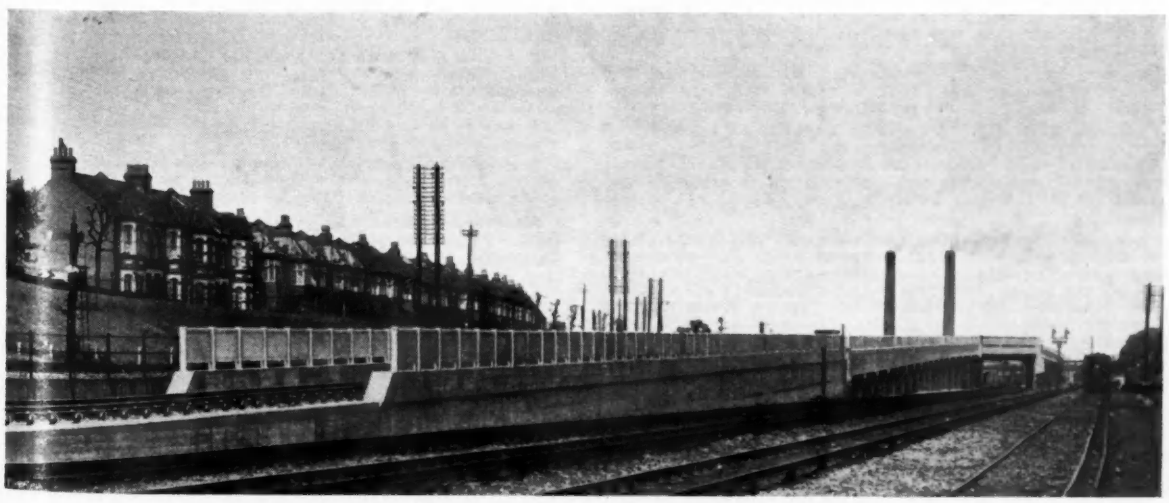
When completed, the new electric signal box at Waterloo will contain 309 levers and will displace six signal boxes containing a total of 504 manually operated levers. One of the six and four others were abolished on Sunday last, but it will be several months before the new signal box takes over completely the section between Waterloo and Vauxhall. The advantage of colour-light over manually operated signals is that the headway of trains can be reduced from 4 to 2½ min. and, in some cases, to 2 min.

On the recently completed Vauxhall-Malden section the most intricate part is at Clapham Junction, where all points are now interlocked and controlled electrically by a frame of 103 miniature levers, the complete moving of the points, locking and automatic checking, taking 2½ sec. At Wimbledon and Raynes Park mechanical control of the points will be retained.

The electric signalling between Waterloo and Hampton Court will, when completed, indicate to the driver the condition of the line ahead for three block sections by means of

West London Junction signal box, showing the new frame near the windows and the old ones at the side

red, one yellow, two yellows and green lights. A novel feature is the use of high-speed route indicators mounted above the actual signals leading to a junction. They comprise a row of three powerful white lights inclined vertically to indicate the direction to be taken by the train. Special lenses make them easily visible by day, a black background being provided.



The new S.R. "fly-over" bridge between Wimbledon and Earlsfield

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Aberdeen.—June 15th. Town Council. One 15,000-kW turbo-alternator with condenser and auxiliary plant. (See this issue.)

Australia.—MELBOURNE.—June 8th. State Electricity Commission of Victoria. Steel reinforced aluminium conductors and accessories. (May 15th.)
July 20th. Switchgear and accessories. (T.Y. 30156.)*

Beckenham.—May 25th. Borough Council. L.v. p.i. cables for the period from July 1st, 1936, to March 31st, 1937. (May 15th.)

Bedford.—June 4th. Electricity Department. Meters, water heaters, cookers, cooker control units, kettles, meter boards and cut-outs for twelve months ending September 30th, 1937. (See this issue.)

Birmingham.—June 12th. Electric Supply Committee. E.h.v. and l.v. cables at Hams Hall power station. (See this issue.)

Blackpool.—May 25th. Fylde Water Board. Diesel engines (and alternatively water turbines), 15-kW generators and switchgear at the Grizedale reservoir, Garstang. G. F. Atkinson, engineer, Sefton Street (deposit £1 1s.).

Cannock.—May 25th. U.D.C. Thirteen miles of 3-phase, 11-kV overhead line and pole mounting transformers and switchgear. (May 8th.)

Carlisle.—June 3rd. Electricity Committee. Alteration of the existing buildings at the Distribution Depôt and the erection of a large reinforced concrete structure. (May 8th.)

Chesterfield.—R.D.C. Electrical wiring and internal telephone for new offices. Houfton & Kington, Market Place (deposit £1 1s.).

Croydon.—June 15th. Electricity Department. Stores and materials for twelve months. (See this issue.)

Dumfries.—May 28th. Electricity Department. One four-panel h.v. metal-clad switchboard and two 250-kVA transformers. (May 15th.)

Ealing.—June 4th. Electricity Department. Cables, meters, cut-outs, jointing materials, conduits, frames and covers and general stores, for twelve months ending July 31st, 1937. (See this issue.)

Edinburgh.—June 2nd. Corporation. Two steam generating units for the Portobello generating station. (May 8th.)
May 29th. Commissioners of H.M. Works. Installation of plenum ventilation systems in the new Sheriff Courthouse, Lawnmarket. Engineer, H.M. Office of Works, 122, George Street (deposit 10s.).

Epsom and Ewell.—June 15th. U.D.C. Electricity Department. Steel kiosk, h.v. switchgear, transformer, l.v. cable and multiple stoneware conduits. (See this issue.)

Finchley.—May 25th. Borough Council. 200-kVA transformers. (May 8th.)

Gravesend.—May 23rd. Corporation. L.v. overhead lines in the Northfleet district. (May 8th.)

Halifax.—May 23rd. Education Committee. Electric lighting at Parish Church mixed school and Mixenden school. D. T. Lloyd Jones, borough engineer, Crossley Street (deposit £1 1s.).

Haslemere.—June 1st. U.D.C. Electric lighting in twenty-six houses on the Eight Acres estate, Hindhead. C. A. Best, surveyor to the Council, Council Offices, Museum Hill.

Hastings.—May 28th. Borough Council. One switch and transformer kiosk with oil circuit-breakers. (May 8th.)

Irish Free State.—DUBLIN.—June 19th. Corporation. Electrically driven sewage pump at the main pumping station, Pigeon House. City engineer, 28, Castle Street (deposit £2 2s.).

Kirkcaldy.—May 29th. Borough Council. L.v. and 6.6-kV cables, distribution boxes and trench excavation. (May 15th.)

Lancashire.—June 12th. County Council. Electric lighting at the Westhoughton Senior Girl's Council school. S. Wilkinson, County architect, County Offices, Preston (deposit £2), by May 23rd.

Leyton.—June 19th. Corporation. Removal of existing fittings, re-spacing and wiring and re-instating the electric lighting installation at two schools. (See this issue.)

Lincoln.—June 6th. Electricity Department. One 300-Ah accumulator battery. (See this issue.)
May 25th. Joint Board for the Mentally Defective. Engineering works in connection with workshops to be erected at the Harmston Hall Mental Defective Colony, Lincoln. (See this issue.)

London.—METROPOLITAN WATER BOARD.—June 19th. Four oil engines with centrifugal pumps and electrical generators, two electrically and one water turbine driven borehole pumps, two booster pumps, switchboard and appurtenant works at the Orpington pumping station. Chief engineer, Room 235, 173, Rosebery Avenue, London, E.C.1 (deposit £2 2s. to the accountant).

Manchester.—June 8th. Waterworks Committee. Two electrically driven, multi-stage, centrifugal pumps with automatic switch and control gear, pipes, valves, &c., for erection at Wythenshawe. Chief engineer, Waterworks Offices, Town Hall (deposit £1 1s.).
May 30th. Education Committee. Electrical and heating installations at the Sharston Municipal Senior schools, Wythenshawe. Surveyor's Department, Education Offices, Deansgate.

Middlesbrough.—May 25th. Electricity Department. Conductors and cable. (May 15th.)

Morecambe and Heysham.—May 28th. Borough Council. E.h.v. feeder cables, excavation and laying. (May 15th.)

Musselburgh (MIDLOTHIAN).—June 1st. Town Council. Various works, including electrical, at 100 houses. Borough surveyor.

Northern Ireland.—BELFAST.—May 30th. Electricity Committee. 30,000-kV turbo-alternator plant with auxiliaries and pipework. (May 8th.)
June 6th. High temperature furnace bricks. (See this issue.)

Nottingham.—June 9th. Electricity Committee. General stores for twelve months from July 1st, 1936. (See this issue.)

Oldbury.—June 4th. Education Committee. Electric lighting at the Rounds Green school, Brades Road, and the Rood End schools, Rood End Road. Borough engineer and surveyor, Municipal Bank Chambers.

Preston.—July 7th. Electricity Department. House service type electricity meters, domestic water-heating apparatus and breakfast cookers. (May 15th.)

Richmond (YORKS).—June 3rd. Electricity Department. Two h.v. oil switch cubicles, two l.v. pedestal type switches and two 350-kVA transformers. (See this issue.)

Slough.—May 27th. U.D.C. Two groups of pumping plant with motors, pipe connections, valves, switchgear, &c., and appurtenant works at two pumping stations. G. B. Kershaw & Keufman, 9, Victoria Street, London, S.W.1 (deposit £5).

South Africa.—PRETORIA.—June 5th. Public Works Department. Electric lighting fittings. (T.Y. 30166.)* Three electric lifts. (T.Y. 30165.)*
June 12th. Union Tenders and Supplies Board. Stationary batteries. (T.Y. 30168.)*

South Shields.—June 8th. Corporation. Electrical fittings and lamps for the six months ending December 31st, 1936. (May 15th.)

Stockton-on-Tees.—May 29th. Corporation. Stores, including electrical fittings, for nine months commencing July 1st, 1936. Gas engineer and manager, Corporation Gas Works, Thompson Street.

Stoke-on-Trent.—June 8th. Sewage Purification Department. Electrically driven vertical spindle type pumping plant for extensions and alterations to Hanford sewage pumping station (No. 1) and Austin Street ejector station (No. 2). City sewage engineer, Leek Road (deposit £2).

Swansea.—June 2nd. Electricity Department. Metal-clad switchgear, h.v. cubicles and l.v. sub-station feeder panels. (See this issue.)

Thurso (CAITHNESS).—May 30th. Town Council. Electrical work at thirty-six houses. Sinclair Macdonald & Son, architects (deposit £2 2s.).

Tottenham.—May 25th. Education Committee. Electrical installation in the Downhills, Belmont, Parkhurst and Crowland Road elementary schools. (May 8th.)

Wallasey.—May 25th. Borough Council. H.v. and l.v. p.i. cables and house service meters during year ending June 30th, 1937. (May 8th.)

Wimbledon.—May 28th. Corporation. P.i. cables during the period ending December 31st, 1936. (See this issue.)

* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Aberystwyth.—Town Council. Accepted. Underground cables and accessories (£6,990).—B.I. Cables, Ltd.

Barrow-in-Furness.—Electricity Committee. Accepted. 600-kVA transformer (£244).—British Electric Transformer Co.

Berkshire.—Assistance Committee. Recommended. Electric lighting installation at Wantage Institution (£280).—Lowe & Oliver.

Birkenhead.—Electricity Committee. Accepted. One 200-kVA outdoor type transformer and accessories for the Stuart Road sub-station (£105).—G.E.C. One h.v. switch unit and accessories for the Singleton Avenue sub-station (£157), and four h.v. switch units and accessories for the Mount Road sub-station (£598).—A. Reyrolle & Co.

Chesterfield.—Electricity Committee. Accepted. Cables (£4,368).—Macintosh Cable Co. Rewinding two transformers (£160).—Brush Electrical Engineering Co.

Eastbourne.—Corporation. Accepted. Joint boxes.—Callender's. Pole boxes and cut-outs.—W. Lucy & Co. L.v. cable.—Craigpark Electric Cable Co. Meters.—Met.-Vick. Electrical Co.; Aron Electricity Meter. Switch-fuses.—G.E.C.

Eccles.—Electricity Committee. Accepted. Fuse-board (£106).—Parmiter, Hope & Sugden, Ltd.

Formby.—U.D.C. Accepted. 400-kVA transformer with h.v. switchgear (£239).—Brush Electrical Engineering Co. Sub-station feeder panel (£83).—B.I. Cables.

Gainsborough.—U.D.C. Accepted. Transformer and switchgear for sub-station (£640).—English Electric Co.

Glasgow.—Education Committee. Accepted. Electrical work at the Junior Instruction Centre, Renwick Street (£413).—A. & C. Edelman.
Electricity Committee. Accepted. Water screening plant in connection with the extensions at Dalmarnock power station (£7,080).—F. W. Brackett & Co.

Police Committee. Accepted. Annual supplies of electrical fittings and accessories.—J. Fotheringham; British Electrical and Mfg. Co.; Revo Electric Co.

Public Assistance Committee. Accepted. Electric lighting fittings for the Assembly Hall, Lennox Castle Institution (£154).—G.E.C.

Transport Committee. Accepted. Tramway poles.—A. Devey & Co. Electrodes.—Quasi-Arc Co.; Murex Welding Processes; Welding Rods, Ltd.

Houghton-le-Spring.—R.D.C. Accepted. Electrical installation at ninety-five houses on the Chilton Moor estate.—B. L. Oliver.

Hyde.—Markets Committee. Accepted. Electrical fittings for the market.—H. Bailey & Co.

Keighley.—Electricity Committee. Accepted. Cables for twelve months.—Metropolitan Electric Cable and Const. Co.; B.I. Cables; Armorduct Cable Co.; Mersey Cable Works; Crompton Parkinson.

London.—L.C.C.—Public Assistance Committee. Accepted. Wireless equipment at the Chelsea, Islington, Westminster and Woolwich Institutions (£633).—G. E. Taylor & Co. Wiring and installation of fittings for electric lighting and power at the Hollesley farm (£580).—Mann Egerton & Co. Wiring and installation of fittings for an automatic telephone equipment (£711).—Standard Telephones. Renewals, alterations and modifications to main electricity distribution, power plant, wiring, &c., at the Poplar Institution (£1,660).—City Elecl. Co.

METROPOLITAN WATER BOARD.—Recommended. Steam turbines and pumps, &c., for the Hampton Works (£211,867).—W. H. Allen, Sons & Co. Vertical high-compression heavy fuel oil engine with vertical centrifugal high-lift and borehole pumps, electric generators and appurtenant works, for the Green Street Green pumping station (£8,141).—Harland Engg. Co. Two high-compression heavy fuel oil engines with centrifugal pumps and electric generators, three electric borehole pumps, switchboard and appurtenant works (£20,276).—Brush Elecl. Engg. Co.

STEPNEY.—Electricity Supply Committee. Recommended. Supplies during the year ending June 30th, 1937: Conduits (£1,113) and troughs and covers (£528).—Albion Clay Co. D.c. prepayment meters.—Ferranti, Ltd.; Chamberlain & Hookham, Ltd. Demand indicators.—Reason Manfg. Co. A.c. s. ph. prepayment and polyphase meters.—Aron Elec. Meter, Ltd. Electric lamps.—Wholesale Fittings Co. Alterations to switchgear and the provision of a control cubicle with protective equipment (£448).—Met. Vick. Elecl. Co. One truck type panel in connection with the supply to the Co-operative Wholesale Society, Ltd. (£261).—Johnson & Phillips, Ltd.

Northern Ireland.—BELFAST.—Electricity Committee. Accepted. Coal handling plant and boiler plant at the Harbour power station (£122,620).—Babcock & Wilcox. Feed pump and pipework (£5,735).—Aiton & Co. A.c. motors, &c. (£557).—H. & J. Scott (Belfast). 33-kV switchgear and protective equipment (£3,989).—A. Reyrolle & Co.

Portsmouth.—Electricity Committee. Accepted. Transformers: Six 300-kVA indoor type (£118 each).—G.E.C. Six 75-kVA single-phase (£60 each).—Lindley Thompson Transformer & Service Co. One 500-kVA indoor type (£178), six 200-kVA indoor type (£95 each), one 500-kVA indoor type (£180), and nine 200-kVA indoor type (£98 each).—Yorkshire Electric Transformer Co. Switchgear: Flat-back, l.v. boards and screens, metal-clad boards, 11,000-V metal-clad switchgear, &c., and 6,000-V metal-clad switchgear, &c.—English Electric Co.

Seaham Harbour.—Electric Committee. Accepted. 130 electric wash-boilers (£312).—Revo Electric Co.

Shipley.—Housing Committee. Accepted. Electrical installations in thirty-six cottages in Victoria Road.—G. Binns.

Electricity Committee. Accepted. Cables for two years.—Hackbridge Cable Co.; Standard Telephones.

Southport.—Electricity Committee. Accepted. Twenty 100-kVA and six 500-kVA transformers.—Electric Construction Co.

Taunton.—Town Council. Accepted. Repairs to alternator at the generating station (£450).—Mather & Platt, Ltd. Fire protection equipment at the generating station (£128).—Pyrene Co.

Wallasey.—Electricity Committee. Accepted. 6,600-V switchgear.—Met.-Vick. Elecl. Co. 2,000-V switchgear.—Ferguson, Pailin. Scott-connected transformers.—Ferranti, Ltd. Cables.—Derby Cables, Ltd.

Wolverhampton.—Electricity Committee. Accepted. Electric hoist (£123).—Pickerings, Ltd.

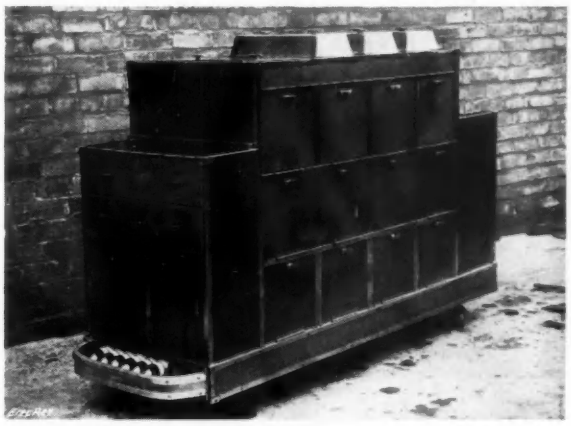
Notes

Corrosion of Metals by Insulating Oils

Researches by Messrs. P. J. Haringhuizen and D. A. Was at Utrecht on the subject of the corrosion of tin and other metals by insulating oils are described in Technical Publication Series A, No. 35, of the International Tin Research and Development Council. By volatising tin, lead or copper from tungsten filaments *in vacuo* extremely thin films of each metal were deposited upon squares of mirror glass. By a series of measurements the thickness of the films was related to the amount of light transmitted by them. This relationship allowed the thinning of the films due to corrosion in insulating oils to be determined. From the experiments it is concluded that the metals build up a protective film of reaction products on their surfaces. In the case of copper this film is continuously destroyed, but tin and lead have a durable resistant film and the diffusion through this film controls the corrosion. Experiments with different oils showed that the velocity of corrosion is not related to the concentration of the acids formed by the deterioration of the oils. The results have been expressed by an experimental formula, for which an attempt is made to provide a theoretical basis. Copies of this publication may be obtained free of charge from the Council, Manfield House, 378, Strand, London, W.C.2.

An Electric Food Trolley

A new form of electrical waiter's trolley has been invented by Mr. William Butlin, proprietor of the Skegness Holiday Camp. These trolleys consist of twenty-four cupboards and containers for soup, sweets and extra vegetables. The meals are put on the plates in the kitchens and covered with flat-



The trolley with twenty-four electrically heated food compartments

topped soup plates. Four placed on top of each other go into each cupboard, so that each trolley carries nearly 100 complete meals. The trolleys are electrically heated, with a switch for every four cupboards. They are plugged in in the kitchen and again in the restaurant. Monel metal has been used for their construction.

I.E.E. Summer Meeting

Local members of the Institution of Electrical Engineers who are unable to take part in the visits and excursions during the summer meeting in Scotland (June 15th to 20th) may, nevertheless, especially those in Glasgow and district, attend the reception and dance to be held at the Central Station Hotel on Monday evening, June 15th. Tickets (10s. 6d. single and 15s. double) are obtainable from Mr. Joseph Taylor, 154, West George Street, Glasgow, C.2.

The summer meeting of the Western Centre commences to-day (Friday) and continues until Monday, May 25th, and, as already announced, will be held at the Abernant Lake Hotel, Llanwrtyd, Central Wales. Particulars of accommodation, visits and the golf competition can be obtained on application to Mr. H. R. Beasant, secretary, 77, Old Market Street, Bristol, 2.

Portable Photometers

Beside the specification revised last September (No. 230-1935) which deals with the visual type of portable photometer, there is now a British Standard Specification (No. 667) which covers the requirements for portable photometers in which the test surface embodies a rectifier photoelectric cell. The new specification defines "photoelectric cell" and "rectifier photoelectric cell," and classifies two types of photometer: Type A for low illumination measurements, Type B for medium and high. It also gives the effective range, the scale and figuring, the effect of temperature, the effect of colour of the light source and limits of error. Other clauses deal with oblique illumination, general design and external finish. An appendix shows how to correct for sources having large colour differences from the standard adopted. Copies of the specification can be obtained from the Publications Department, British Standards Institution, 28, Victoria Street, London, S.W.1, price 2s. 2d. post free.

The "Queen Mary"

In our article last week on the *Queen Mary* we described the Whipp and Bourne main and auxiliary switchboards and the Allen West control gear. Several hundreds of ammeters and

Our Service Department

EVERY day inquiries of all kinds are received by the Editors, the bulk of them relating to the producers of specified classes of electrical goods. We are able to reply to most of these with the aid of our extensive records, but in a few cases we have to seek the assistance of our readers. This week we have been asked for the names and addresses of manufacturers of the following:—

ATLAS kettle.

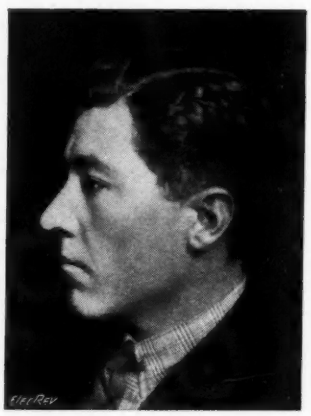
BAKERLITE wiring system.

Readers should enclose stamped addressed envelopes when making their inquiries.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. R. Alan S. Thwaites, M.Inst.C.E., M.I.E.E., of the North Wales Power Co., Ltd., has been elected chairman of the North Wales Sub-Branch of the Association of Mining Electrical Engineers for the ensuing session.



Gravure Co.

Mr. D. Winton Thorpe

Mr. D. Winton Thorpe, the author of the article on "Electricity in the Factory," which appears on page 739, received his training at Faraday House and in 1924 was on the Secretariat (Technical) of the first World Power conference organised by B.E.A.M.A. and held at Wembley. From 1924 to 1926 he was on the editorial staff of *World Power* (formerly the *B.E.A.M.A. Journal*), and from 1926-1927 he was in the Publicity Department of the General Electric Co., Ltd., following which he became a director of Messrs. Thorpe & Thorpe, Ltd., electrical contractors. Since 1932 he has been in business on his own account as a consulting electrical engineer.

Mr. A. Cunnington was elected president of the Illuminating Engineering Society for the ensuing year at the annual meeting of the Society held on May 12th.

Mr. G. E. Wells, until recently a director of Messrs. Edgar Allen & Co., Ltd., Sheffield, has now joined the board of Messrs. Kryn & Lahy (1928), Ltd., Letchworth, Herts. Mr. Wells's connection with Messrs. Edgar Allen dates from 1900, and for seventeen years he was a director, occupying also the position of foundry manager. He was responsible for the design of the entire foundry and its equipment. During the war Mr. Wells acted as controller of the whole of the iron and steel foundries in Great Britain on behalf of the Minister of Munitions.

Mr. H. J. W. Bullard has been presented with an all-mains wireless receiver by the staff of the Norwich Corporation Electricity Department on leaving to take up a post with the Surrey County Council.

Mr. J. E. Chamberlain

Mr. J. E. Chamberlain, who has been appointed managing director of Switchgear & Cowans, Ltd., has been largely responsible for the introduction of mercury-arc rectifiers as a substitute for rotary convertors. Our readers will remember that Switchgear & Cowans, Ltd., was recently converted into a public company.

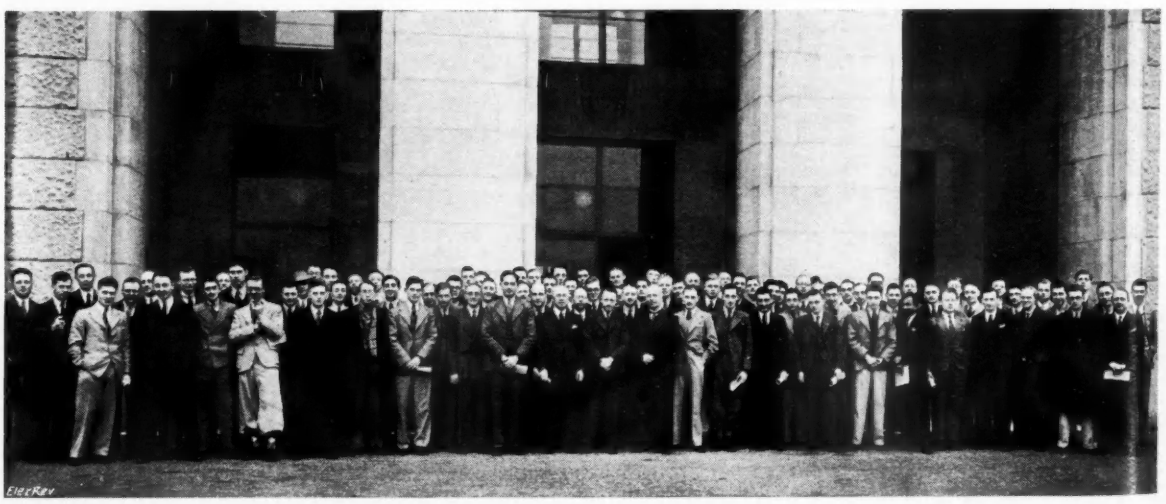
Mr. E. Mallett, D.Sc. (Eng.), of the Woolwich Polytechnic, has been nominated for the chairmanship of the Wireless Section of the Institution of Electrical Engineers for the session 1936-37.

Mr. W. A. Turnbull, M.Inst.C.E., M.I.E.E., Wh.Ex., informs us that he recently resigned the position of chief electrical engineer and manager to the Aylesbury electricity undertaking after twenty-two years' service, and that he is taking up consulting work. His address is Weardall, Wendover Road, Aylesbury, Bucks.

Obituary

Mr. C. F. Topham.—The death occurred on May 10th, at Coventry, at the age of seventy-three, of Mr. Charles Fred Topham, one of the pioneers of the rayon industry, who was associated with the late Sir Joseph W. Swan and Mr. C. Stearn in their early electric lighting experiments. With Mr. Stearn he founded one of the first Continental incandescent lamp factories in Switzerland, and later established a lamp factory at Kew.

Mr. G. C. Roxburgh, manager of the Condenser Department of Messrs. Worthington-Simpson, Ltd., died on May 17th following an operation for appendicitis. The interment took place on May 20th at Putney Vale Cemetery.



Members of the English Electric (Stafford Works) Engineering Society who recently made a tour of the buildings and inspected the plant at the Droitwich station of the B.B.C.

Notes *(Continued from preceding page)*

voltmeters made by Messrs. Crompton Parkinson, Ltd., were used for these, mostly of standard pattern, so mounted that the joints are completely waterproof.

The fire-alarm indicator designed by the Telephone Manufacturing Co., Ltd., is laid out in three panels (measuring 7 by 7 ft. overall) each of which is etched with the outlines of four decks. It covers the alarm signal for the Mather & Platt sprinkler system, manual-push alarms and the public-room and cargo-space alarms. Nearly 300 lamps of one colour for each system light up on the operation of the corresponding sprinkler or manual push; at the same time the alarm bell in the fire station and fire signals in the engine room are caused to function. Electrical fittings for the promenade deck, boat deck and galley were among the chief items supplied by Messrs. Andrew Chalmers & Mitchell, who also provided several thousands of well-glass fittings, cast-iron loop-in boxes, junction boxes for light-current services and packing glands.

Appointments Vacant

Temporary electrical engineering assistants for the Air Ministry.

Consumers' engineer for Workington Electricity Department.

Civilian technical officers in the Admiralty Technical Pool.

Lady demonstrator and showroom assistant for Nelson Electricity Department.

Instructor at the Bulawayo Technical School for the Education Department of Southern Rhodesia.

(See our classified advertisements.)

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Electrical Switchgear & Associated Manufacturers, Ltd.—Public company. Registered May 14th. Nominal capital, £225,000 in 100,000 5 per cent. cumulative preference shares of £1 each and 250,000 ordinary shares of 10s. each. The objects are to acquire not less than 90 per cent. of the issued share capital of Brookhirst Switchgear, Ltd., to adopt an agreement with J. A. Hirst, E. N. Humphreys and A. C. Livesey; to acquire, hold and deal in shares and securities issued by and the property and assets of companies and undertakings dealing in switchgear and electrical plant and apparatus, including radio and other reproducing instruments; to act as a central organisation and co-ordinating body for the encouragement and advancement of co-operation, development and research between companies financially associated through the company, and for promoting and safeguarding the rights, interests and activities of any such companies and undertakings, &c. The following are directors: S. J. L. Hardie, Thames House, Millbank, S.W.1 (vice-chairman, British Oxygen Co., Ltd.), J. A. Hirst, Deganwy, N. Wales (joint managing director, Brookhirst Switchgear, Ltd.), and E. N. Humphreys, Gogarth, Llandudno (joint managing director, Brookhirst Switchgear, Ltd.). Registered office: Australia House, Strand, W.C.2.

Central Distributors, Ltd.—Private company. Registered May 13th. Capital, £350. Objects: To carry on the business of distributors of refrigerators of all kinds and electric or gas-operated or controlled articles, manufacturers of and dealers in hardware, &c. The directors are: E. M. Crease (chairman), address not stated, and two others. Solicitors: Timbrell, Deighton & Nichols, 3, Lawrence Pountney Hill, E.C.4.

F. W. Lane, Ltd.—Private company. Registered May 13th. Capital, £1,000. Objects: To carry on the business of designers and manufacturers of and dealers in wireless and electrical apparatus, appliances, accessories, and supplies, &c. The subscribers are: F. W. Lane, 41a, West Street, Oundle, and three others. F. W. Lane is permanent director.

G. B. Carnegie & Co., Ltd.—Private company. Registered May 13th. Capital, £500. Objects: To acquire the business of an electrical engineer and dealer in electrical apparatus carried on by G. B. Carnegie at 48, Gallowgate, Newcastle-on-Tyne. The permanent directors are: G. B. Carnegie and Jessie M. V. Carnegie, both of 1, Burnside, Spital Tongues, Newcastle-on-Tyne. Registered office: 48, Gallowgate, Newcastle-on-Tyne.

Express Magneto & Electrical Co. (Jersey), Ltd.—Private company. Registered May 11th. Capital, £1,000. Objects: To acquire the business of the Express Magneto & Electrical Co., carried on by Hector S. B. Cox at Lucas House, Jersey, and to carry on the business of electrical equipment specialists, &c. The subscribers are: H. S. B. Cox, 2, Belgreve Terrace, Dicq Road, Jersey, and T. O. Cox, Folly Field, Hutton, Weston-super-Mare. H. S. B. Cox is the first director. Secretary: T. O. Cox. Registered office: 28, Baldwin Street, Bristol.

Britannia Switchgear & Electrical Equipment Co., Ltd.—Private company. Registered May 15th. Capital, £1,000. Objects: To carry on the business of manufacturers of, agents for and dealers in switchgear and electrical equipment and apparatus, &c. The directors are: E. J. Ferguson, Graylands, Horsell, Woking, and H. Ferguson, The Corrie, Oakleigh Avenue, Whetstone, Middlesex. Registered office: 22/6, Britannia Street, City Road, N.1.

Scottish Neon Sign Service, Ltd.—Private company. Registered in Edinburgh May 15th. Capital, £1,000. Objects: To carry on the business of advertising and publicity agents, manufacturers of and dealers in and erectors of advertisements, including illuminated signs, &c. The subscribers are: J. B. McLaren, 5, Braedbar Road, Giffnock, Glasgow, and A. Heissner, 12, Barnbank Terrace, Glasgow. Secretary: J. P. Glen. Registered office: 47, Oswald Street, Glasgow.

Neon (Portsmouth), Ltd.—Private company. Registered May 16th. Capital, £1,000. Objects: To acquire the business of a manufacturer of and dealer in neon and other signs now carried on by Richard C. Abbiss, at 6, Lake Road, Portsmouth, as "Abbiss Signs." The permanent directors are: K. C. Byerley, 3, Kings Terrace, Southsea, and T. B. Birkett, 132, High Street, Portsmouth. Solicitors: Hellard, Bechervaise & Birkett, Portsmouth.

Reynolds Rolling Mills, Ltd.—Private company. Registered May 16th. Nominal capital, £200,000. Objects: To carry on the business of manufacturers of and dealers in rolled sheets, strips and sections, and allied products in aluminium alloys, rollers of all kinds of metals, steel makers, ironmasters, mechanical, electrical, hydraulic, automobile and general engineers, electricians, machinists, fitters, tube makers, &c. The first directors are: W. C. Devereux (deemed to have been appointed by the holders of three-fourths of shares 1 to 50,000), and A. M. Reynolds, E. A. Reynolds, H. L. Trevorrow, A. J. S. Aston, and J. H. Aston (deemed to have been appointed by the holders of three-fourths of the shares numbered 50,001 to 150,000). Solicitors: Pinsent & Co., 6, Bennetts Hill, Birmingham.

Universal Distributing Co., Ltd.—Private company. Registered May 4th. Capital, £100. Objects: To carry on the business of manufacturers of and dealers in electrical and other lamps, violet ray and X-ray tubes and apparatus, &c. The directors are: A. A. Isaacs (chairman), 35, Eton Avenue, N.W.3, and four others. Registered office: 89, Great Eastern Street, E.C.2.

Corta, Ltd.—Private company. Registered May 7th. Capital, £300. Obejcts: To produce, sell or deal with a telephone device for taking up slack cord, and to acquire the trade mark "Certa." The subscribers are: F. L. Kerran, 17, Rudall Crescent, Hampstead, N.W.3; and T. Linsternikay, 12, Belsize Grove, N.W.3. F. L. Kerran is the first director.

Wireless Novelty, Ltd.—Private company. Registered April 20th. Capital, £100. Objects: To carry on the business of importers, exporters and manufacturers of, agents for and dealers in all instruments, appliances, accessories and tools relating to wireless telephony and telegraphy, mechanical and electrical engineers, &c. The directors are: Major F. R. Samson, Blue Vines, Queen's Road, Weybridge, and two others. Secretary: Alfred N. Clissold. Registered office: 311, Gray's Inn Road, W.C.1.

Car & General Radio, Ltd.—Private company. Registered April 6th. Capital, £100. Objects: To carry on the business of manufacturers of and/or dealers in motor vehicles and accessories, wireless telegraph and television apparatus, &c. The permanent directors are: C. A. Barber, Alva Cottage, Fox Corner, Worplesden, Surrey; and H. W. Grist, 3, Dulwich Wood Park, S.E.19. Registered office: 38, Avenue Chambers, 4, Vernon Place, W.C.1.

Commercial X-Rays, Ltd.—Private company. Registered May 8th. Capital, £100. Objects: To carry on the business of radiographers and electro-therapeutists, &c. The directors are: E. A. Titley, Lynton, Thornhill Road, Streetley, Warwickshire, and two others. Secretary: E. A. Titley. Registered office: York House, 38, Great Charles Street, Birmingham.

Wirelect Trust, Ltd.—Private company. Registered May 11th. Capital, £100. Objects: To finance the sale of goods and merchandise of all kinds, &c. The directors are: Chas. E. Coulson, 42, Zetland Road, Bristol, 6, and two others.

Returns of Electrical Companies

Detex (1931), Ltd.—E. P. R. d'Hugenet-Llewellyn, 77, Grosvenor Street, W., ceased to act as receiver and/or manager on March 14th, 1936.

E. Dyne & Co., Ltd.—Particulars filed of £3,000 debentures, authorised April 22nd, 1936, charged on the company's undertaking and property, present and future, including uncalled capital (if any), the amount of the present issue being £2,000.

Aylesbury Battery & Electrical Co., Ltd.—Particulars filed of £1,000 debentures, authorised April 25th, 1936, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Automatic Electrical & Mechanical Controls, Ltd.—Issue on May 1st, 1936, of £100 debentures, part of a series already registered.

Oakes & Liversage, Ltd.—Agreement, dated April 25th, 1936, to secure all moneys due or to become due under certain hire-purchase agreements, charged on certain wireless sets and accessories to be sold from time to time under hire-purchase agreements. Holder: J. Sanderson, Kent Green, Ches.

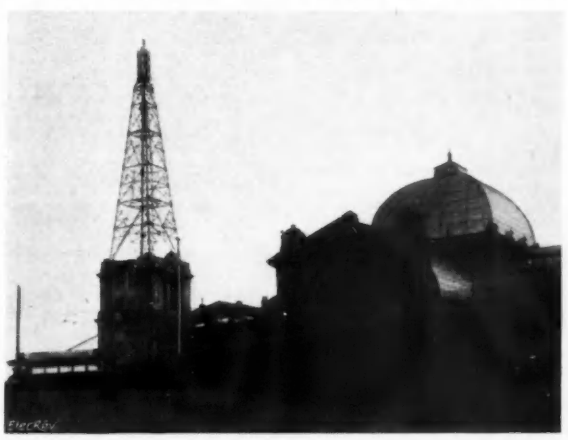
Hampshire Ignition, Ltd.—Capital, £3,000 in £1 shares. Return dated December 27th, 1935. 2,250 shares taken up. £750 paid, £1,500 considered as paid. Mortgages and charges, nil.

Robert Scaife (Colne), Ltd.—Particulars filed of £250 debentures, authorised April 16th, 1936, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Star Welding Co., Ltd.—E. J. C. Swaysland, 601/2, Grand Buildings, Trafalgar Square, W.C.2, was appointed receiver and manager on May 8th, 1936, under powers contained in debentures dated April 15th, 1931.

W. A. Beeston, Ltd.—Debenture dated May 4th, 1936, to secure £250 charged on the company's property, present and future, including uncalled capital. Holder: W. B. Heywood, Fernhill House, Caythorpe, Notts.

Slough & Datchet Electric Supply Co., Ltd.—Satisfaction in full on April 30th, 1936, of deed of security dated December



The mast for the television station at the Alexandra Palace in course of construction. It will be 300 ft. high when completed

29th, 1922, and registered January 6th, 1923. (According to the register of mortgages, the deed of security registered January 6th, 1923, originally secured £35,000 with covenant to make further advances up to an additional £5,000.)

Park Bros., Ltd.—The nominal capital has been increased by the addition of £5,000 beyond the registered capital of £6,000. The additional capital is divided into 4,000 6 per cent. cumulative preference and 1,000 ordinary shares of £1 each.

Archer Electric, Ltd.—A. Blain, 21/22, Bedford Row, W.C.1, was appointed receiver and manager on May 11th, 1936, under powers contained in debenture dated November 29th, 1935.

P. J. Haskins, Ltd.—Debenture dated April 21st, 1936, to secure £1,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: P. J. Haskins, 5, High Street, Weston-super-Mare.

F. Gaskell, Ltd.—Debenture dated May 2nd, 1936, to secure £400, charged on the company's property, and assets, present and future, including uncalled capital. Holder: P. J. Elliner, Grendon Cottage, Bridgnorth.

Quadrant Electric Co., Ltd.—Capital, £10,000 in 2s. shares. Return dated December 28th, 1935 (filed March 25th, 1936). 45,031 shares taken up. £3 2s. paid on 81 shares, £4,500 considered as paid on 45,000 shares. Mortgages and charges, nil.

Southall Radio Relay Service, Ltd.—Capital, £5,500 in 5,000 10 per cent. cumulative preference shares of £1 and 10,000 deferred ordinary shares of 1s. Return dated January 4th, 1936. 3,495 preference and 8,495 ordinary shares taken up. £3,669 15s. paid on 3,495 preference and 3,495 deferred ordinary shares, £250 considered as paid on 5,000 deferred ordinary shares. Mortgages and charges, nil.

British Thermostat Co., Ltd.—Satisfaction in full on January 31st, 1936, of debentures dated July 1st, 1930, to September 28th, 1934, and registered on various dates from July 5th, 1930, to October 1st, 1934. (Notice filed May 12th, 1936.)

Chepstow Electric Lighting & Power Co., Ltd.—The nominal capital has been increased by the addition of £17,000 in £1 shares beyond the registered capital of £10,000. At March 6th, 1936, the West Gloucestershire Power Co., Ltd., held 5,256 shares out of 5,510 issued.

Lighting Installations, Ltd.—Capital, £200 in £1 shares. Return dated December 31st, 1935. 100 shares taken up. £100 paid. Mortgages and charges, nil.

Sheppey Relay Service, Ltd.—Capital, £4,000 in 3,000 preference shares of £1 and 20,000 ordinary shares of 1s. Return dated December 31st, 1935 (filed March 25th, 1936). 10,000 ordinary shares issued for cash. Mortgages and charges, nil.

Rochester Relay Service, Ltd.—Capital, £5,000 in 4,000 preference shares of £1 and 20,000 ordinary shares of 1s. Return dated January 7th, 1936. 3,015 preference and 10,000 ordinary shares taken up. £3,515 paid. Mortgages and charges, nil.

Commercial Telephone Co., Ltd.—Capital, £25,000 in 17,250 ordinary and 7,750 deferred shares of £1 each. Return dated December 21st, 1935. 1,250 ordinary and 750 deferred shares taken up. £2,000 paid. Mortgages and charges, nil. A return of allotments made up to January 6th, 1936, shows a further 400 ordinary shares allotted, payable in cash, and fully called up.

Victor Electrics, Ltd.—Mortgage on leasehold land and buildings in Victoria Street, Burscough, Lancs, dated April 29th, 1936, to secure all moneys due or to become due from the company to Midland Bank, Ltd.

Readylock, Ltd.—Issue on April 24th, 1936, of £950 debentures, part of a series already registered.

Mitchell Electric Co., Ltd.—Debenture, dated April 15th, 1936, to secure £230, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: R. S. Keith, 38, Woodcote Close, Epsom, Surrey.

Baker's Selhurst Radio, Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1935 (filed March 18th, 1936). 500 shares taken up. £500 paid. Mortgages and charges, nil.

Dagnalls (Radio and Electrical), Ltd.—Particulars filed of debentures, not exceeding £1,000, authorised March 27th, 1936, charged on the company's property, present and future, including uncalled capital, the amount of the present issue being £1,000.

Alandale Radio & Television Co., Ltd.—A. E. Stevens, 100, Canberra Road, Charlton, S.E.7, was appointed receiver and manager on April 9th, 1936, under powers contained in debentures dated July 31st, 1935, and March 24th, 1936.

Lackmakers (Radio), Ltd.—Capital, £1,000 in £1 shares. Return dated February 28th, 1936. 860 shares taken up. £352 paid, £508 considered as paid. Mortgages and charges nil.

M. Adams (Radio), Ltd.—Capital, £200 in £1 shares. Return dated July 10th, 1935 (filed March 12th, 1936). 157 shares taken up. £152 paid. £5 considered as paid. Mortgages and charges, nil.

Edgbaston Radio & Electric Co., Ltd.—Capital, £2,000 in £1 shares. Return dated December 23rd, 1935 (filed April 14th, 1936). 1,000 shares taken up. £1,000 paid. Mortgages and charges, nil.

Vacuums, Ltd.—Issue on April 28th, 1936, of £300 debentures, part of a series already registered.

Burchnell's Battery Service, Ltd.—Capital, £3.000 in £1 shares. Return dated December 31st, 1935 (filed March 24th, 1936). 1,346 shares taken up. £1,218 paid. £128 considered as paid. Mortgages and charges, £1,000.

Hendersons Wholesale Electrical & Radio, Ltd.—Capital, £15,000 in £1 shares. Return dated January 20th, 1936. 10,000 shares taken up. £10,000 paid. Mortgages and charges, nil.

F. W. Lechner & Co., Ltd.—Capital, £750 in £1 shares (increased from £300 on November 22nd, 1935). Return dated February 27th, 1936. 400 shares taken up. £400 paid. Mortgages and charges, nil.

City Notes

W. T. Henley's Telegraph Works Co., Ltd., held its annual meeting on May 15th, Sir Montague Hughman (chairman) presiding. In presenting the report and accounts (ELEC. REV., May 8th, p. 693), the chairman said that during the past nine months there had been steady progress, increased efficiency, increased employment and increased output in all departments. The prices of commodities had shown a general advance, and although various restriction schemes were in operation it was hard to forecast what the prices of copper, lead and rubber would be in the future. The business overseas continued to expand in a satisfactory manner, but this was entirely due to the work they had done in British possessions. Their foreign business was restricted for many reasons, including the difficulties of exchange and of getting money out of foreign countries for goods supplied. With regard to the Gravesend works, the output of the Copper Wire Drawing Department had been a record one, while the output of paper cables had also steadily increased. Records had been made in the size and weight of power cables manufactured in one length, and during the year they delivered to China two of the heaviest lengths of cable ever sent from the works on drums, each of which weighed approximately 33½ tons. The Engineering Department had been exceptionally busy, having turned out the heaviest weight of goods ever manufactured in any year since its inception. At their North Woolwich works the output of rubber-covered wires and cables was the largest in the history of the company, and the gross tonnage exceeded all previous records. To deal with the expansion of the rubber cable business a new building had now been erected. The first portion of this was brought into use in June last and it was hoped that the remainder would be ready for occupation about the middle of the current year. Their output during the first four months of the current year showed an increase over the corresponding period of 1935. Regarding their Research Department, the year had seen many advances in the scientific knowledge of their processes and products. During 1935 the Henley Extrusion Machine Co., Ltd., was formed, one half of the shares were held by them and the remainder by some of the larger cable companies to exploit the continuous lead extruding machine patents. A small factory had been equipped for manufacture, and already orders had been received from home and the Continent for machines. The Contract Department had been very active and an increasing volume of business had been carried out. To-day they had on hand more business in this Department than a year ago. Henley's (South Africa) Telegraph Works Co., Ltd., continued to make satisfactory progress. The Henley Tyre & Rubber Co., Ltd., had been completely reorganised and they could anticipate a substantial increase in the turnover. The outlook with regard to the sports goods side of the business was favourable. Their youngest subsidiary, the Holborn Construction Co., Ltd., was making satisfactory progress, and a small profit had been made during the year ended March 31st last. The volume of business which they had in hand at the moment in their parent company and in their subsidiaries, showed an increase over the figures of this time last year.

Mr. W. F. Bishop, general manager, in seconding the adoption of the report and accounts, said that both at home and in the principal overseas markets there had been a continued expansion of trade and they had taken their full share of the increased business. The improvement had been general, the majority of their customers having more orders to place. Of the various contracts secured during 1935, mention should be made of that for the supply and installation of about thirty-five miles of 66,000-V single-core oil-filled cable for the County of London Electric Supply Co., Ltd. Another was for the supply and installation of the cables, including 66,000-V oil-filled cables, required for the new Fulham power station. Following the completion of contracts for the supply and erection of 66,000-V transmission line in India, they had another contract in hand for a further 57½ miles, making a total of 167½ miles now constructed or in hand.

Telephone Properties, Ltd., held its annual meeting on May 19th, Mr. H. S. Bennett presiding in the absence of Sir Alexander Roger (chairman), who is on the Continent on business. He read the chairman's speech, and said that the Nacional Company of Venezuela, in which they were interested, gained a small increase in stations compared with a somewhat heavy loss in 1934. Although the gross revenue disclosed a slight reduction it was possible to effect measures of economy which more than offset the fall in receipts, and the net position showed a modest improvement. The present concession was granted to the Nacional Company in 1930 and expired in 1965; it prescribed, among other things, the tariffs that might be charged. These tariffs had evoked some criticism, and the company was studying the question of whether any alterations or modifications could be made. The Caracas system of the Nacional Company was 90 per cent. automatic, and automatic operation was proposed for Maracaibo. With regard to communication between Caracas and Maracaibo, it was understood that it would be through the medium of Government-owned radio-telephony stations, but the Nacional Company was prepared to offer its services in the administration of the service under a similar agreement to that existing between the Government and the company in respect of the international radio system.

Siemens Bros. & Co., Ltd., report a profit for the year ended December 31st last of £220,690, after providing for all working and management expenses, including depreciation, and after deducting £15,432 contribution to pension fund and retiring allowances. This compares with a profit of £144,149 in the preceding year, from which £13,584 was contributed to pension fund. To the profit is added £332,985 brought in, making £553,675. After deducting debenture interest and the preference dividend, it is proposed to pay a dividend of 6 per cent. on the ordinary shares (against 4 per cent.), and to carry forward £339,724. The report states that the improvement in the general trade conditions, which began to materialise in the latter half of 1934, is reflected in the accounts. The whole of

the outstanding 4½ per cent. debenture stock was redeemed on July 15th last. Reference is made to the formation, in conjunction with the Telegraph Construction & Maintenance Co., Ltd., of Submarine Cables, Ltd., each company holding half of the capital. At an extraordinary meeting following the annual meeting to-day (Friday), proposals will be submitted for converting the preference and ordinary shares into preference and ordinary stock.

Cable & Wireless (Holding), Ltd., reports that with dividends receivable from subsidiary companies amounting to £1,039,574 and transfer fees and interest of £80,660 there is a gross revenue for 1935 of £1,120,234, against £1,080,393 for the preceding year. The profit for the year is £1,026,041 (against £936,901), to which is added £128,398 brought in, making £1,154,439 available. From this £64,534 is paid in interest to preference stockholders for the period July 31st to November 30th, 1935, on the purchase price of preference stock sold to the company for cancellation, and a dividend of 5½ per cent., less tax, is now recommended on the cumulative preference stock, being the balance of the dividend in respect of 1933 and a payment of 1⅜ per cent. on account of 1934. This with the interest payment already made absorbs £986,677 and leaves a balance to be carried forward of £167,762. The Eastern Extension Australasia and China Telegraph Co. and the Western Telegraph Co. have paid special dividends during 1935 from their general reserves and such dividends have been applied to write off the formation expenses of the holding company and to write down the book value of the holdings in those companies. During the year the capital of the company has been reduced from £53,700,000 to £47,246,593, and the holders of 5½ per cent. preference stock agreed to sell to the extent of £6,453,407 to the company and this stock has accordingly been cancelled. Meeting: To-day (Friday).

Cable & Wireless, Ltd., reports a gross revenue for 1935 of £5,019,773, as compared with £4,777,281 for the previous year. In addition to the ordinary expenses, £135,162 has been provided for cable renewals and £75,500 has been written off in respect of losses of subsidiary companies and the cost of terminating a joint purse agreement and other expenditures. The profit for the year, at £1,001,397, was £375,851 more than in 1934, and it is proposed to pay a dividend of £3 6s. 8d. per cent., less tax (against 2 per cent. for 1934). In the reserve account a sum of £640,201 is also available, representing sundry profits and provisions, and from this the payment of a special dividend of £2 2s. 8d. per cent. is recommended.

The Western Telegraph Co., Ltd., reports a net profit for 1935 of £447,244, as compared with £300,390 for the preceding year, to which is added £5,282 brought in, making £452,526. Reserve receives £163,472, and it is proposed to pay a dividend of 9 per cent. on the ordinary stock (against 9½ per cent.), leaving £8,349 to be carried forward.

The Eastern Telegraph Co. reports a net profit for 1935, including a special dividend of £238,497 from Cable & Wireless, Ltd., of £724,798, as against £353,646 in the preceding year. The dividend on the ordinary stock is raised from 5½ per cent. to 6 per cent., and £13,433 is carried forward.

The Eastern Extension, Australasia & China Telegraph Co., Ltd., reports a net profit for 1935 of £581,639, as compared with £381,096 for 1934. After placing £214,862 to reserve it is proposed to pay a dividend of 9 per cent. on the ordinary stock (against 9½ per cent.), and to carry forward £10,050.

Marconi's Wireless Telegraph Co., Ltd., reports a net profit for 1935 of £259,806, which was £34,074 more than in the previous year. To this is added £9,224 brought in, making £269,030 available. After meeting the preference dividend and transferring £152,941 to an equalisation of dividends reserve account, it is proposed to pay an ordinary dividend of 4½ per cent., less tax, against 6 per cent. for 1934, and to carry forward £7,683.

The Delhi Electric Supply & Traction Co., Ltd., reports a net revenue for 1935, including profit on exchange and miscellaneous income, of £52,916, as against £55,143 in the preceding year. After deducting administrative charges and interest (£4,217) and adding £24,031 brought in, there is a balance of £72,730. From this depreciation and renewals reserve receives £7,000, British & Indian taxation £10,000, and general reserve £4,619. It is proposed to pay a final dividend of 8 per cent., making 12 per cent. for the year, and leaving £27,111 to be carried forward. The sales of electricity increased from 7,723,131 kWh to 8,495,034 kWh, but the number of passengers carried on the transport system fell from 7,345,676 to 6,991,092.

The West Devon Electric Supply Co., Ltd., reports a profit for 1935 of £17,122, as compared with £12,033 in the preceding year. General reserve receives £1,000, and it is proposed to pay an ordinary dividend of 5 per cent. (against 4 per cent.), leaving £1,196 to be carried forward. In June last the capital was increased to £350,000 by the creation of 100,000 additional ordinary shares of £1 each. The subsidiary undertakings continue to make satisfactory progress. The bulk supply of electricity to Bude was commenced in April, 1935, and since that date until the end of the year about 90 per cent. of the total requirements of the Bude company was generated by water power. The number of kWh generated by water power was 3,058,649, equivalent to nearly 93 per cent. of the total output.

The Craigpark Electric Cable Co., Ltd., reports a profit for the year ended March 31st last of £3,877, as compared with £3,208 in the preceding year, to which is added £2,980 brought in, making £6,858. From this there has been written off for depreciation of plant and machinery £4,000, leaving a balance (subject to payment of directors' fees) of £2,858, which is carried forward. The directors regret that the improvement in the trading results is not more substantial, but continued low prices and keen competition still affect the trading position of the company. Further substantial economies have been effected, and considerable expenditure has been incurred during the past year in bringing the plant up to date.

The Sphere Investment Trust, Ltd., reports a net revenue for the year ended March 31st last of £46,641, as compared with £39,547 in the previous year. To this is added £13,100 brought in, and after placing £3,000 to reserve, it is proposed to pay an ordinary dividend of 4 per cent. (against 3 per cent.), and to carry forward £13,429. It is proposed to increase the capital to £1,200,000 by the creation of 200,000 new shares of £1 and to issue 100,000 as 6 per cent. cumulative preference shares. These will rank as to dividend from such date or dates as the board may think fit and in all other respects *pari passu* with the existing 6 per cent. cumulative preference shares.

The Chloride Electrical Storage Co., Ltd., reports a profit for the year ended March 31st last of £426,800, as compared with £422,045 in the preceding year. A further profit of £28,896 has been received from a subsidiary in respect of investment sales. It is proposed to pay a final dividend of 5 per cent. and a bonus of 5 per cent., again making 15 per cent. for the year on the "A" and "B" ordinary shares, and to place £125,000 to general reserve. Meeting: May 29th.

Ward & Goldstone, Ltd., have declared a final ordinary dividend of 10 per cent., making 15 per cent. for the year (against 10 per cent.). It is again proposed to distribute a capital bonus of one new share for every ten held.

The Dubilier Condenser Co., Ltd., proposes to pay a dividend of 20 per cent. on the 1s. ordinary shares for the year ended March 31st last. The dividend for 1934-35 was 15 per cent.

The Madras Electric Supply Corporation, Ltd., reports a net profit for 1935 of £81,619, as compared with £73,806 in 1934. The final ordinary dividend is 5½ per cent. maintaining the distribution for the year at 8 per cent., tax free, and the balance carried forward is raised from £26,858 to £36,772. The sales of electricity amounted to 35,310,145 kWh, an increase of 11.4 per cent. as compared with 1934.

The Brazilian Traction, Light & Power Co. is resuming ordinary dividends with a payment of 30 cents a share. Payment to non-residents of Canada will be subject to deduction of the Canadian income tax of 5 per cent. No dividend was paid on the ordinary shares for 1933 or 1934.

J. Stone & Co. report a trading profit for 1935 of £196,044, as compared with £107,085 in the previous year, and a net profit of £125,650 (against £44,195). A dividend of 10 per cent. is proposed on the ordinary shares for the year (against nil), and the balance carried forward is increased from £99,050 to £125,660.

Meters, Ltd., reports a net profit for the year ended March 31st last of £20,781, as compared with £20,402 for 1934-35. The final ordinary dividend is 6½ per cent., again making 9 per cent. for the year, and £8,209 is carried forward.

The Canadian General Electric Co. has announced a dividend of $1.25 a share on the common stock for the quarter ending June 30th.

The Pennsylvania Water & Power Co. has announced a dividend of $1 on the common shares for the quarter ending June 30th.

Stocks and Shares

TUESDAY EVENING.

STOCK Exchange markets as a whole are proceeding on such jog-trot, not to say humdrum, lines, that it may almost be said that business is reduced to a more or less bread and butter affair. The financial atmosphere is charged with the uncertainties of foreign politics, while at home the appetite of the investor for industrial shares is less keen than it was a few weeks ago, with the net result that the disposition of the House as a whole has become a trifle reactionary. Board of Trade statistics point to a mild contraction here and there in the activities of domestic trades, the electrical industry being amongst those fortunate enough to show continued expansion. The purely gilt-edged stocks maintain their prices with comparative steadiness, the market in them being overhung, however, by so considerable an outpouring of new issues on behalf of corporations and similar borrowers, that the prices of existing securities are inclined to ease off. Speculation is running high in a few stocks and shares, the popular gambles of the moment being in the oil and mining markets. Of general business, however, the Stock Exchange member finds there is not a great deal to employ his energies.

American Developments

The experience of the New York Stock Exchange corresponds fairly closely with that of our own. A Presidential election is looming in the distance, the result of which is expected to be the return of President Roosevelt, whose socialistic theories render him no friend to financial interests. On the other hand, some of his New Deal schemes are being vetoed by United States Courts, the effect being that business in stocks and shares in Wall Street has quietened down. The American investor and speculator are now awaiting fresh developments, but the utility shares, with a few exceptions, keep their prices very well.

Electricity Supply Shares

Calcutta Electrics have declined steadily, since the company's annual meeting, from 62s. to 55s. The impending reduction of charges to consumers is the reason. It is believed that the reductions will be too sharp to be offset by expanding output, and that profits will suffer to some extent. Among the shares of other companies operating abroad, Palestine "A," at 47s., remain weak on the prolonged state of tension in the country, but Jerusalem Electrics are no worse at 37s. 6d. East Africans shed 6d. to 31s. 9d. ex dividend, and Atlas 6d. to 5s. 6d.

In the Home electricity supply group, North Metropolitans are 1/6 lower at 2⅛. There is no animation in the market, and other price changes are scarcely worthy of note. Losses up to 1s. are shown by Llanellys at 25s. 3d., British Power

and Light at 31s., Metropolitans at 51s. 6d., and Edmundsons at 43s. 6d. ex dividend. County of London new 3½ per cent. debentures stand at a premium of ¼ over the issue price of par.

Electrical Equipment Shares

Chloride Electrical Storage shares gave way sharply on the dividend statement, but partially recovered later on. A higher dividend, or a bonus distribution, had been confidently expected. Disappointment with the maintenance of the previous rate of 15 per cent. was reflected at first in falls of about half a sovereign each in the "A" and "B" shares to the common level of 87s. 6d. Recovery lifted the price to 90s. 6d. ex dividend. Even at the reduced level, the yield offered to a buyer of the shares is well under 3½ per cent. Justification for the modesty of this return is found in the strong reserve built up by a conservative dividend policy. Last year's earnings represent nearly 40 per cent. on the ordinary capital.

The market as a whole is quiet, but not without points of interest. Telephone Manufacturing shares make a good showing, with Ericssons 2¼, Halls 21s. 3d., and Telephone Manufacturing, 9s. 9d. all higher on the week. The last-named company proposes to offer 200,000 new 5s. shares to shareholders at 6s. 9d. per share in the proportion of one new for every five held. International Automatic ordinary are dull, in contrast, at 46s. 9d. Telegraph Condensers have sagged to 2⅛ since the general meeting, and Siemens are 1s. 6d. lower at 26s. 3d., ex dividend, despite the good report. Other shares which have lost ground are Callenders, Arons and English Electrics. Crompton Parkinson are a good spot at 65s. on interim dividend talk, and Reyrolles are harder at 71s.

Brazilian Tractions

The market was pleasantly taken by surprise at the Brazilian Traction Company's decision to resume cash dividends for the first time since 1932. The price of the shares, assisted in part by the more optimistic tone of American markets, responded well with a net rise of 2 to 12¾. This is, nevertheless, still well below the year's best price of 15, and the shares are being talked a good deal higher. It is recalled that, before the depression set in, the company was earning up to three dollars per share; the shares stood as high as 84 in 1929.

The Hydro Electric Securities Company has a big stake in Brazilian Tractions. The price of the shares recovered from 6⅝ to 7½ by reason of that fact. This company, too, has been an absentee from the dividend list since 1932. The price has been considerably higher during this year, but compares with a low level of 2½ in 1935. Going to the other extreme, it may be mentioned that the shares soared to 57 in 1930. International Holdings improved from 1⅝ to 2 on the company's connection with Hydro Electrics and Brazilian Tractions.

Telegraphs and Telephones

The figures in the Cable and Wireless Combine's accounts are in line with what most people were led to expect by last month's payment in full of the 5½ per cent. preference dividend, and by the published traffic indices. In the absence of any surprises in the report, the prices of the stocks remain much as they were. No mention is made of any proposed adjustment of the capital structure. It is widely believed that this is bound to come sooner or later, in view of the discrepancy which exists between the company's asset values and its earning capacity. The Marconi's Wireless Company's report is important to Cable and Wireless stockholders, not only because of the direct interest, but also on account of the cautious dividend policy which unsettled international affairs have inspired.

Various electrical communication stock prices improved under the influence of American support. The veil of depression which has been hanging over transatlantic markets has been partially dispelled. There seems to be no better reason for the change than the feeling that pessimism has of late been overdone. American Telephone and Telegraph shares are 6 points to the good at 162½, compared with 152½ a fortnight ago. Internationals put on 1 to 14, and Western Unions 3½ to 78½. Radios are a point higher at 11. Canadian Marconis remain on the dull side at 8s.

Miscellaneous Matters

Franco Signs 10s. shares attracted a good deal of attention upon their introduction to the market. A strong demand for the shares at the opening price of 16s. 3d. quickly raised the quotation to 18s. The newly issued Heatrae 2s. shares, offered at 3s. 6d., are being dealt in at slightly above that price. Other comparative newcomers incline generally to the easy side, Switchgear and Cowans 14s., International Combustions 98s., Pressed Steels 23s. 9d., and J. F. Stones 8s. 3d., all being small fractions lower.

Electric and Musical Industries are 3d. off at 25s. 3d. E. K. Coles eased 6d. to 27s. 9d., but recovered to 28s. 6d. Broadcast Relays regained 1s. to 8s. 6d. on the adoption of a more optimistic view of the outcome of the Ullswater report recommendations. British Vacuum Cleaners fell half a crown to 35s. but Vactrics improved to 26s. 6d. Swedish Electrolux are ⅛ lower at 10⅝ ex dividend. American Electrolux Corporations are 23 ex dividend.

Babcock and Wilcox declined 1s. 6d. further to 48s., the market for iron, steel and allied shares being less popular than it was a month ago. The rubber market peacefully slumbers.

Share List of Electrical Companies

	Nom.	Dividend. Previous.	Dividend. Last.	Price May 19.	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	77/6	—	3 17 5
City of London	1	7½	7½	37/6	—	4 0 0
Clyde Valley	1	7	8	45/-	—	3 11 1
County of London	1	10½	10½	56/6	—	3 14 4
Edmundson's 7% Pref.	1	7	7	36/-	—	3 17 9
Do. Ord.	1	8	8	43/6xd.	−1/6	3 13 7
Elec. Dis. Yorkshire	1	9	9	47/6	—	3 16 7
Elec. Fin. and Securities	1	12½	12½	3 7/8	—	3 12 9
Elec. Supply Corporation	1	11	11	63/-	—	3 9 10
Lancs Light and Power	1	7½	7½	39/-	—	3 17 0
Lond. Assoc. Electric	1	—	7	34/6	—	4 1 2
London Electric	1	7	8	40/-	—	4 0 0
London Power Deb. Red.	Stock	5	5	108½	—	4 12 2
Metropolitan	1	10	10	51/6	—	3 17 7
Midland Counties	1	7	7½	41/-	—	3 13 2
Mid. Elec. Power	1	8	8	42/-	—	3 16 2
North Eastern Electric Ordinary	1	6	6	35/-	—	3 8 7
Do. 7% Pref.	1	7	7	35/-	—	4 0 0
Northampton	1	10	10	53/9	—	3 14 5
Notting Hill 6% Pref.	10	6	6	14½	—	4 2 9
North Met. Elec. Ordinary	1	10	10	55	−½	3 8 0
Do. do. 6% Pref.	1	6	6	32/-	—	3 15 0
Scottish Power	1	8	8	43/6	—	3 13 7
South London	1	7	7	34/6	—	4 1 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	25/6	—	5 17 8
Yorkshire Elec.	1	8	8	46/-	—	3 9 7
PUBLIC BOARDS.						
Central Electricity, 1950–70	Stock	5	5	118	—	4 4 9
Do. 1955–75	,,	5	5	120	—	4 3 4
Do. 1951–73	,,	4½	4½	112	—	4 0 4
Do. 1963–93	,,	—	3½	102	—	3 8 8
London Elec. Trans. Gtd.	,,	—	2½	97	—	2 11 7
London & Home Counties, 1955–75	,,	4½	4½	113	—	3 19 8
London Passenger Transport, A	,,	—	4½	125½	—	3 11 9
Do. do. B	,,	—	5	129	—	3 17 6
Do. do. C	,,	3½	4	103	—	3 17 8
West Midlands Joint Elec. 1948–68	,,	—	5	116½	—	4 5 10
TELEGRAPH AND TELEPHONE.						
American Tel. & Tel.	$100	9	9	162½	+6	5 10 9
Anglo-Am. Tel. Pref.	Stock	6	6	125½	+1	4 15 7
Do. Def.	,,	1½	1½	30	—	5 0 0
Cable & Wireless 5½% Pref.	,,	4½	5½	111½	—	4 18 8
Do. A. 7½% Ord.	,,	Nil	Nil	28	—	—
Do. B. Ord.	,,	Nil	Nil	8	—	—
Globe Tel. & Tel. Ord.	10	2⅛	3½*	16½	—	2 3 4
Do. do. Pref.	10	6	6	14½	—	4 4 3
Great Northern Tel.	10	20	20	44	—	4 11 0
Marconi-Marine	1	10	7½	32/6	—	4 12 4
Oriental Telephone Ord.	1	12*	12*	3½	—	3 16 10
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	1/-	—	—
Do. do. 2nd Pref.	5	Nil	Nil	9d.	—	—
Do. do. 5% Deb	Stock	Nil	Nil	5	—	—
British Electric Traction Df. Ord.	,,	5	5	1550xd.	+4	—
Do. do. Pref. Ord.	,,	8	8	179½xd.	+2	4 8 2
Brazil Traction	100	—	30 cts.	12⅝	+2	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	102½	—	4 17 7
Mexican Light Common	100	Nil	Nil	3½	—	—
Do. 1st Bonds	$500	5	5	50	—	—
Victoria Falls Ord.	1	20	20	77/6	—	—
West Riding	1	5	6½	52/6	—	2 9 6
MANUFACTURING COMPANIES.						
Aron Electricity Ord.	1	10	15	63/9	−½	4 14 4
Assoc. Elec. Ord.	1	6	8	46/-	−6d.	3 9 7
Do. Pref.	1	8	8	39/-	—	4 2 1
Babcock & Wilcox	1	8	8	48/-	−1/6	3 6 8
British Aluminium Ord.	1	7½	7½	40/-	—	3 15 0
British Insulated Ord.	1	15	20	5¼	—	3 14 5
Brush Ord.	Stock	Nil	Nil	42½	—	—
Callender's	1	15	15	4⅛	−⅛	3 8 6
Do. 6½% Pref.	1	6½	6½	32/6	—	4 0 0
Crompton Parkinson Ord.	5/-	—	12½	65/-	—	1 0 0
Do. 8% Pref.	1	8	8	2	—	4 0 0
Edison Swan 1st Pref.	1	7½	7½	30/-	—	5 0 0
Electric Construction	1	Nil	3½	1⅜	—	2 0 0
Enfield Cable Ord.	1	25	25	5¾	—	4 13 0
English Electric	1	Nil	Nil	21/6	−6d.	—
Do. do. Pref.	1	Nil	Nil	25/6	—	—
Ericsson Tel.	5/-	24	20*	2¼	+⅛	2 4 6
Ever Ready	5/-	35	35	25/6	—	6 17 3
Ferranti Pref.	1	7	7	27/-	—	5 3 8
G.E.C. Pref.	1	6½	6½	32/-xd.	−1/-	4 1 3
Do. Ord.	1	8	10	79/-	—	2 10 8
Henleys	1	30	30	7⅛	−⅛	4 2 0
Do. 4½% Pref.	5	4½	4½	5¼	—	3 18 3
India-Rubber Preferred	1	—	5½	1¼	—	4 17 9
Johnson & Phillips	1	7½	10	46/3	—	4 6 6
Lancashire Dynamo	1	5	10	2¼	—	4 9 0
Siemens Ord.	1	4½	6	26/3xd.	−½	4 11 5
Telegraph Construction	£1	Nil	Nil	26/3	—	—

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1934

21166. "Electric radiators." H. H. Berry. July 19th, 1934. (445853.)

27012. "Plug-and-socket and other couplings, switches, fuses and similar electrical appliances." G. E. Crabtree, W. T. Elliott, E. Balham and R. W. Thornton (legal representatives of J. A. Crabtree, dec.). September 20th, 1934. (446090.)

29061. "Telephone systems." Telephone Manufacturing Co., Ltd., J. G. Flint and L. E. Ryall. October 10th, 1934. (445860.)

29091. "Safety means for television tubes." Radioakt-Ges. D. S. Loewe. October 11th, 1933. (446171.)

29414. "Electric direction-control apparatus for electric vehicles." E. F. Jeffries and A. W. Byatt. October 15th, 1934. (445933.)

29459. "Electrical connectors." C. A. Bourne. October 15th, 1934. (445863.)

29465. "Electric lampholders and the like." A. P. Turnbull and P. G. Archer. October 27th, 1933. (445864.)

29987. "Electric indicating apparatus." British Thomson-Houston Co., Ltd., and P. Mathews. October 19th, 1934. (445886.)

30046. "Electron-discharge device amplifiers." Marconi's Wireless Telegraph Co., Ltd., and H. J. Round. October 19th, 1934. (Cognate application 30047/34.) (445893.)

30048/9. "Television and like scanning systems." Marconi's Wireless Telegraph Co., Ltd., H. M. Dowsett and L. E. Q. Walker. October 19th, 1934. (445938/445894.)

30070. "Gas and electric domestic ovens." S. F. Newcombe. October 20th, 1934. (445939.)

30146. "Dry cells." K. Bastrup and J. P. H. Gjerulff. October 20th, 1934. (445897.)

30205. "Overhead electric distribution systems." Pirelli-General Cable Works, Ltd., and J. R. Harding. October 22nd, 1934. (445941.)

30315. "Dispersive electric light fittings for mines or the like." H. J. Fisher. October 23rd, 1934. (446096.)

30395. "Electric leading-in insulators." Telefonaktiebolaget L. M. Ericsson. December 6th, 1933. (446102.)

30516. "Cam-operated electric switches, particularly for electric cookers." Diamond H Switches, Ltd. July 3rd, 1934. (446178.)

30547. "Cathode-ray tubes." F. H. Nicoll. October 24th, 1934. (446180.)

30763. "Conduits for electrical wiring." Wiremold Co. January 18th, 1934. (446017.)

30798. "Electrical switches and circuit-breakers." J. S. Highfield and W. E. Highfield. October 26th, 1934. (Cognate application 684/35.) (446105.)

30925. "Electrical insulator and method of making the same." Champion Spark Plug Co. November 8th, 1933. (446106.)

31793. "Electric-discharge devices." Siemens & Halske Akt.-Ges. November 3rd, 1933. (445948.)

32548. "Electric switching arrangement for the remote-control of rotary machines." H. Simon, Ltd., and J. C. Brian. November 12th, 1934. (445952.)

33849. "Building up of surfaces of track rails of tramways, railways, and the like." C. R. Deglon and Associated Electrical Industries, Ltd. November 24th, 1934. (446111.)

35310. "Duplex telephony and telegraphy by the use of thermionic interrupters." W. A. Loth and J. A. Givelet. December 18th, 1934. (446115.)

35917. "Current transformers." Harland Engineering Co., Ltd., and G. Caton. December 24th, 1934. (445964.)

1935

363. "Accessories for electrical conduit installations." A. F. W. Richards and H. Bright. January 4th, 1935. (446029.)

669. "High-potential fuses." Siemens-Schuckertwerke Akt.-Ges. January 8th, 1934. (Cognate application 670/35.) (445902.)

1643. "Apparatus for measuring the frequency of impulses." S. Strauss and L. Weisglass. January 18th, 1934. (Cognate application 1644/35.) (446031.)

3089. "Disturbance suppressors for use in connection with wireless receivers." Belling & Lee, Ltd., and A. G. Haslam. January 30th, 1935. (445970.)

4628. "Cathode-ray tubes." F. J. G. Van Den Bosch. February 13th, 1935. (445975.)

5537. "Electrically operated hand tools." R. Bosch Akt.-Ges. February 22nd, 1934. (445906.)

5844. "Electrical plug-and-socket connecting means." C. L. Arnold and M. K. Electric, Ltd. February 23rd, 1935. (446216.)

6186. "Systems for converting direct current to alternating current." A. C. Turtle. February 26th, 1935. (446130.)

6952. "Electric-arc heating torches." D. A. Pearson and Metropolitan-Vickers Electrical Co., Ltd. March 5th, 1935. (446217.)

9273. "Attenuation controlling electrical networks." Siemens & Halske Akt.-Ges. March 23rd, 1934. (445977.)

9385. "Cathode-ray tubes for television and like purposes." General Electric Co., Ltd., and B. P. Dudding. March 26th, 1935. (445978.)

11419. "Means for eliminating harmonics from an alternating-current network." British Thomson-Houston Co., Ltd. April 21st, 1934. (446223.)

11654. "Electrodes and electrical contacts." E. Schattaneck. September 3rd, 1934. (Cognate application 11655/35.) (445982.)

12366. "Electromagnetic time-element devices." British Thomson-Houston Co., Ltd. April 24th, 1934. (446135.)

12903. "Convertor arrangements for direct-current installations, particularly, although not essentially, electrolysis installations." Siemens-Schuckertwerke Akt.-Ges. October 29th, 1934. (Cognate application 12904/35.) (445985.)

14947. "Thermally-controlled time-delay switches." British Thomson-Houston Co., Ltd. May 23rd, 1934. (446138.)

15212. "Signal-transmission systems involving unattended repeater stations." Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.). May 24th, 1935. (Convention date not granted.) (446225.)

15474. "Switches, more especially for electrically operated hand-tools." J. J. V. Armstrong (R. Bosch Akt.-Ges.). May 28th, 1935. (Convention date not granted.) (446140.)

16170. "Arrangements for receiving programmes transmitted through a telephone network with the aid of low-frequency oscillations comprising an amplifier which is to be connected to the telephone lines through a switch." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 8th, 1935. (446044.)

18347. "Television and like systems." C. O. Browne. October 18th, 1934. (Divided out of 29874/34.) (445912.)

19483. "Iron cores for induction coils and methods of producing same." C. Lorenz Akt.-Ges. July 14th, 1934. (446227.)

19810. "Electric-battery charging systems." Ford Motor Co., Ltd. October 29th, 1934. (446228.)

20254. "Carrier-wave signalling system." Hazeltine Corporation. November 15th, 1934. (445917.)

20795. "Electrical oscillation generators." Telefunken Ges. für Drahtlose Telegraphie. July 20th, 1934. (446145.)

23077. "Apparatus for automatically controlling the charging of secondary electric batteries." R. Wetzer. August 16th, 1935. (446229.)

24506. "Intertia-operated electric switches for use on vehicles and other moving bodies." A. Carpmael. (Soc. Anon. Tubest.) September 2nd, 1935. (446230.)

25095. "Electron-discharge devices." Telefunken Ges. für Drahtlose Telegraphie. September 8th, 1934. (Addition to 28449/34.) (446231.)

25678. "Magnet cores." British Thomson-Houston Co., Ltd. September 19th, 1934. (446232.)

28005. "Electron-discharge devices." Soc. Francaise Radio-Electrique. October 26th, 1934. (446156.)

28135. "Electric supply meters." British Thomson-Houston Co., Ltd. October 11th, 1934. (Addition to 437761.) (445923.)

28316. "Electric ovens, particularly for preparing eatables." S. Dunlop (Maatschappij van Berkel's Patent Naamlooze Vennootschap). October 14th, 1935. (446157.)

28472. "Electric remote-control systems." British Thomson-Houston Co., Ltd. October 16th, 1934. (445995.)

29175. "Electromagnetic brakes." H. Leitner. October 22nd, 1934. (Divided out of 30300/34.) (Cognate application 30545/34.) (446159.)

30706. "High-frequency inductance devices." Johnson Laboratories, Inc. November 11th, 1933. (Divided out of 30892/34. (445998.)

35976. "Electric thermal relays." British Thomson-Houston Co., Ltd. December 29th, 1934. (446241.)

1936

7695. "Electric-arc atomic hydrogen heating torches." A. L. Guest and Associated Electrical Industries, Ltd. January 9th, 1936. (Addition to 439644.) (Divided out of 22493/34.) (446007.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from May 13th:—

Zenith. No. 548610. Class 6. Rotary electrical transformers, convertors and rectifiers, electrical machines for varying electrical resistance, power or voltage, motors and generators, electric welding machines, fans, blowers, &c. No. 548611. Class 13. Electrodes, electric soldering irons, hair curlers and wavers, switches (ordinary) and parts thereof, combined electric switches and fuses, electric fusible cutouts, fitted electrical fuseboards, &c.—Zenith Electric Co., Ltd., Zenith Works, Villiers Road, Willesden Green, N.W.2.

Arlita. No. 566524. Class 8. Philosophical and scientific instruments and apparatus for useful purposes. No. 566528. Class 15. Glass. No. 566529. Class 18. Engineering, architectural and building contrivances.—Philips Lamps, Ltd., 145, Charing Cross Road, W.C.2.

Philora. No. 566651. Class 8. Philosophical and scientific instruments and apparatus for useful purposes. No. 566553. Class 18. Engineering, architectural and building contrivances.—Philips Lamps, Ltd.

Shield (design only). No. 566714. Class 8. Philosophical and scientific instruments and apparatus for useful purposes. No. 566716. Class 11. Instruments, apparatus and contrivances (not medicated) for surgical or curative purposes or in relation to the health of men and animals. No. 566717. Class 13. Electric lamps and electric lighting fittings. No. 566718. Class 15. Glass. No. 566719. Class 18. Engineering architectural and building contrivances.—Philips Lamps, Ltd.

Ultrasol. No. 566536. Class 11. Instruments, apparatus and contrivances (not medicated) for surgical or curative purposes or in relation to the health of men and animals.—Philips Lamps, Ltd.

Colorenta. No. 566559. Philinea. No. 566560. Philiflood. No. 566539. Photomirenta. No. 556542. Argaphoto. No. 566543. Rectalux. No. 566544. Star and Circle (design only). No. 566713. Electric lamps and electric lighting fittings.—Philips Lamps, Ltd.

Philiray. No. 565517. Class 13. Electric lamps and electric lighting fittings. No. 566518. Class 15. Glass.—Philips Lamps, Ltd.

Phililux. No. 556534. Class 13. Electric lamps and electric lighting fittings. No. 566535. Class 15. Glass.—Philips Lamps, Ltd.

Philuma. No. 566531. Phililite. No. 566535. Class 15. Glass.—Philips Lamps, Ltd.

Metacol. No. 565875. Class 13. Adhesive tape.—Johnson & Johnson (Great Britain), Ltd., Fairlie Road, Slough Trading Estate, Slough.

Imcoy. No. 564399. Class 50. Electrical insulating tape impregnated with india-rubber or with bitumen.—K. V. Hill, Shepley Street Works, London Road, Manchester.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Alton (HAMPSHIRE).—Houses (68), Anstey; U.D.C. surveyor.

Acton.—Factory, Bashley Road; Magnus Cohen & Co., 6, Park Royal Road, London, N.W.10.

Aldershot.—Cinema (1,700 seats) for the Union Cinema, Ltd., 15, Lower Regent Street, W.1.

Aylesbury.—Cinema, Cambridge Street, for the Odeon Theatres, Ltd., Cornhill House, Bennett's Hill, Birmingham.

Ayrshire.—Schools, Dalleagles, Kilmarnock, and extensions to Ayr Academy; director of education, Ayr.

Bacup.—Houses (100), Thorn estate; H. Guffogg, borough surveyor, Town Hall.

Barrow-in-Furness.—Houses (98), Ocean Road; J. Parkinson & Sons, Ltd. Houses, Roosegate and Risedale estate (£109,500); Nicholson & Wright, Ltd.

Birkenhead.—Houses, Hoylake Road and Ilchester Road; borough engineer. Cinema, Woodchurch Road, Prenton; Charles Townsend, Little Crosby Road, Crosby.

Birmingham.—Block of administrative offices (six storeys), Civic Centre site, Easy Row (£292,550); T. C. Howitt, architect, Nottingham. Four churches and three church halls; Canon J. C. Lucas, organising secretary; 72b, Queen's College Chambers. Cinema, Great Barr; Mr. Appleton, architect, Great Barr.

Blackpool.—Houses (20), Pierson Avenue; R. Fielding & Son.

Blackweir (NEAR CARDIFF).—Factory for Rapid Precast Cement Co.

Bournemouth.—Schools, Charminster (£57,401); director of education. Police headquarters, Madeira Road (£33,000); borough surveyor.

Bridlington.—Entertainments hall (£25,000), electrical work; P. M. Newton, borough architect.

Bromsgrove.—Houses (99), &c. (£35,061); Towers, Wilson & Co., builders, Tettenhall, Wolverhampton.

Buckinghamshire.—Senior school (£41,630), Slough, for county E.C.; county architect, Aylesbury.

Burton-on-Trent.—Extensions to Town Hall (£40,000); borough engineer.

Carlisle.—Alterations and additions to the electricity depôt, James Street, for C.C.; city electrical engineer.

Chester.—Business stores, High Street, Neston, for the Co-operative Society; W. Lewis, general manager, 3, Forest Street.

Chesterfield.—Houses (49); Mr. Wikeley, R.D.C. surveyor.

Darlington.—Houses, near Brinkburn Avenue; Bussey and Armstrong, builders, Brinkburn Road.

Dartford.—Houses, Ashen Drive; Chas. Osborne (Builders), Ltd. Houses (118), St. Vincent's estate; McManus & Co., Ltd. Municipal buildings and assembly hall; P. D. Hepworth, assessor architect, 7, Gray's Inn Place, London, W.C.1.

Denbighshire.—School, Allington; director of education, Wrexham.

Devonshire.—Senior council school, Bampton, and additions to senior council school, Plymstock, also grammar school, Okehampton; H. V. de Courcy Hague, architect, 97, Heavitree Road, Exeter.

Dumbarton.—County buildings (£105,000); county clerk.

East Sussex.—Senior schools, Oathall Park, Haywards Heath (£19,000); director of education, Chichester.

Eccles.—Houses (49), Edison Road; J. Chapman & Son, Ltd. Houses (82), near Shackleton Street; F. W. Titterington. Houses (36), near Worsley Road; Bridgewater Estates, Ltd.

Essex.—Hospitals, Dagenham and Chadwell Heath; county architect, Chelmsford.

Forres.—Houses (42); John Rankine, burgh surveyor, Forres House.

Gillingham (KENT).—Houses (24), Hunter's Way, for A. E. Clifford & Co.

Glasgow.—Church, Balmore Road; St. Matthew's Episcopal trustees. School, Capelrig Street; city architect. Extensions to factory, Bogmoor Road; Scottish Wholesale Co-operative Society, Ltd. Extensions to factory, David Street; Acme Wringers, Ltd.

Grays (ESSEX).—Houses (96), East Tilbury, for the Bata Shoe Co. Bazaar stores, High Street, for F. W. Woolworth & Co.

Hasbury (WORCESTERSHIRE).—Cinema at the corner of Blackberry Lane and Haglen Road, for S. Bray.

Hertford.—Houses (70); borough surveyor.

Hitchin.—Houses (56); B. S. Ewing, R.D.C. surveyor.

Horden.—R.C. school; D. Ranken, Ltd., builders, Stockton Road, Sunderland.

Hounslow.—Branch shops and showrooms, 222-226, High Street, for Montague Burton, Ltd., Hudson Road Mills, Leeds; F. J. Moreton & Co., builders, Gipsy Road, London, S.E.27.

Hyde.—Houses (168), Dukinfield Road; J. Williams. Houses (52), Victoria Street; Roger B. Key.

Inverness.—Medical block (48 beds), reconstruction of radiological department, and north block (£25,667), Royal Northern Infirmary; R. Gilbert, hon. secretary.

Irish Free State.—CORK.—Houses (266). Gurranabraher; J. R. Boyd-Barrett, architect, 61, South Mall, Cork.

Keighley.—Houses (50), Guard House estate; borough engineer.

Kirkcaldy.—Cinema (£25,000); Peter Crerar, Dollerie Terrace, Crieff. Large suite of offices for Michael Nairn & Co., Ltd.; the manager.

Liverpool.—Concert hall for the Philharmonic Society (2,000 seats); J. Ainslie Robertson, chairman of the society.

London.—(LEWISHAM).—Houses (74), Thorpewood Avenue; G. T. Harman, 90a, High Street, S.E.13. (ST. JOHN'S WOOD).—Laboratories, Barrow Hill waterworks, for the Metropolitan Water Board (£62,840); J. Murray Easton, architect, 58, Wildwood Road, N.W.11. (BATTERSEA).—Central school, Calvert Road (£51,500); L.C.C. architect.

Lowestoft.—Box factory, Belvedere Road; Jewson & Sons, Ltd.

Monkseaton (NORTHUMBERLAND).—Cinema, junction of Cauldwell Lane and Seatonville Road, for the Regal Cinema (Monkseaton), Ltd. (£20,000); Thomas Clements & Sons, builders, Selbourne Gardens, Newcastle-on-Tyne.

Morayshire.—County Council offices, Elgin; county clerk, Elgin.

Nantyglo.—Houses (52), Brynteg, Blaina; U.D.C. surveyor.

Newcastle (STAFFORDSHIRE).—Houses (200), Cross Heath estate; borough surveyor.

Newcastle-on-Tyne.—Model bakery and factory, Coast Road, for Lees Bakeries, Ltd., Melbourne Street.

North Riding.—School, Scarborough; county architect, Northallerton.

Northwich.—Cinema, for the Cheshire County Cinemas, Ltd.; William & Segar Owen, architects, Palmyra Square Chambers, Warrington.

Norwich.—Factory, Fishergate; Jones & Co., Leicester.

Nottinghamshire.—County hall and offices, Trent Bridge (£200,000), for C.C.

Prescot.—Houses (78), Shaw Lane site; J. G. Gregson, U.D.C. surveyor.

Prestonpans.—Houses (46); J. F. Rowberry, burgh surveyor, Council Office.

Ramsgate.—Houses (25), Wilfred Road, for H. W. Wilson.

Rotherham.—Houses (144), Thorpe Common; J. V. Dowling. Extensions to Municipal offices (£30,300); borough engineer.

Ryde.—Commodore cinema (£34,000), electrical work, for Ryde Cinema, Ltd.; O. H. Collins, architect, 115, Old Broad Street, London, E.C.2.

St. Albans.—Houses (26), near Flora Grove, for J. Hammond & Son, Ltd. Shops, offices, &c., St. Peter's Street, for Price's Tailors, Ltd., Leeds. Houses (36), Colney Hatch; R.D.C. surveyor. Extensions to Hospital (£40,096); St. Albans and Harpenden Joint Board.

Salisbury.—Houses (70); W. H. Bryant, builder. R.C. church, Bemerton; Rev. Father M. J. Hyland.

Sheldon (NEAR BIRMINGHAM).—Cinema, for the Coronet Theatre (Small Heath), Ltd.

Skelton (YORKSHIRE).—Houses (53); U.D.C. surveyor.

Southport.—Art school, for E.C.

Stratford-on-Avon.—Cinema, electrical work, for Bath Cinema Co. (Leamington), Ltd.; Bradley & Clarke, architects. Houses (58); borough surveyor.

Stretford.—Houses (238), Lostock estate, and construction of roads, &c.; J. Maunders & Son, Barton Road. Boiler house and transformer house, Skerton Road; British Arkady Co., Ltd. Factory, Warwick Road; Driscoll Bros., Ltd.

Sunderland.—Houses (138), Alexandra Road, for R. D. Nelson; G. E. Matkin, architect, Barclay's Bank Chambers, Fawcett Street. Bacon factory (£30,000); R. H. Bell, promoter. "Willmore" Holmlands Park, Roker. Cinema at the junction of Alexandra Road and Ryhope Road; J. H. Morton & Sons, architects, Martins Bank Chambers, Fowler Street, South Shields. Shop premises, High Street West, for Montague Burton, Ltd.; staff architect, Hudson Road Mills, Leeds. R.C. school, Millfield; J. Cummings, builder, Matamba Street.

Surrey.—Girls' grammar school, Farnham, and county school for girls, Purley, for county E.C.; secretary, Kingston.

Swinton.—Council offices (£69,283); borough engineer.

Tanfield (DURHAM).—Houses (124), Tantobie; J. R. Heslop, architect, Tantobie, Newcastle-on-Tyne.

Thornaby-on-Tees.—Houses (100); borough surveyor.

Torquay.—Houses (200), Watcombe; borough engineer.

Warlingham (SURREY).—Houses (26), Shaw Gardens estate; H. J. Sawyers.

Warrington.—Factory, near Hodd Lane, for Mersey Carbons, Ltd., 10, Liverpool Road, Sankey Bridge; Harry Fairclough, builders, Howley.

Warwickshire.—Senior school, Bidford-on-Avon, for County E.C.; county architect, Warwick.

West Hartlepool.—Houses, Dyke House Farm (100 acres); F. Durkin, borough engineer. Church and school, Farndale Road; J. W. English, architect, 18, The Oval. Garage, Stockton Road, for the Bee-line Safety Coaches, Ltd.; H. Garry, architect, 47, Church Street.

West Riding.—Grammar school, Tadcaster (£33,350); county education architect, Wakefield.

Weymouth.—Houses (200), Radipole Spa estate; A. A. Hayward, Spa Road. Houses (140) Goldcroft, and (30) Wyke Regis; borough surveyor.

Whitchurch (SHROPSHIRE).—Houses (33); George Edge, Son & Davies, builders.

Woking (SURREY).—Cinema, for the Union Cinema Co., Ltd., 15, Lower Regent Street, S.W.1.

Wolverhampton.—Modern factory, for Bradburn and Wedge.

Worcester.—Cinema on the site of premises of James Ward (Worcester), Ltd., Broad Street, for Reginald Crapper, High Road, Streatham, London, S.W.16.

Worthing.—Houses (128), Jupps Lane; Chatsmore Estates, Ltd. Extensions to Swandean Hospital; Jeffery & Co.

Wythenshawe (MANCHESTER).—Factory, for the Pioneers Private Telephone Co., Ltd.

York.—School (450 places), Derwent; director of education.

Yorkshire.—Farm institute, Askham Bryan, near York; county education architect, Wakefield.